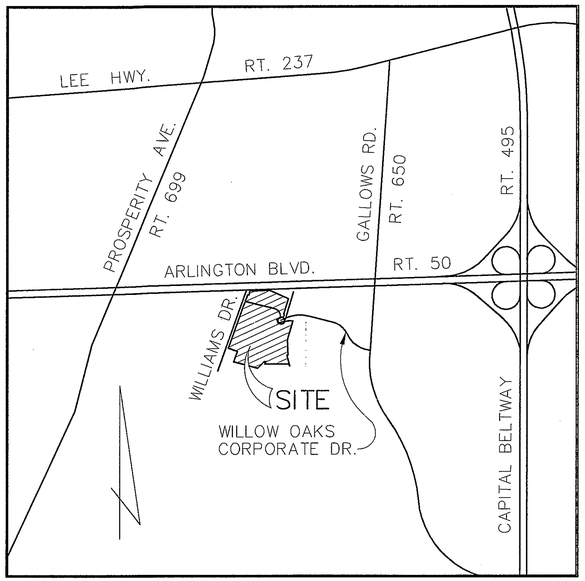
INOVA WILLOW OAKS

Providence District Fairfax County, Virginia

Partial Generalized Development Plan Amendment - PCA 87-P-038-05



VICINITY MAP
SCALE : 1"= 1,000'

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PCA 87-P-038-05
Application No._____ Staff WO'D
APPROVED DEVELOPMENT PLAN
(DP) (GDP) (CDP) (FDP)
SEE PROFFERS DATED 6/20/11
Date of (BOS) (PC) approval 7/20/11
Sheet 1 of 24

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Inova Willow Oaks
Partial Generalized Development
Plan Amendment
PCA 87-P-038-05

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Revised April 27, 2011
Revised March 4, 2011
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Department of Planning & Zoning
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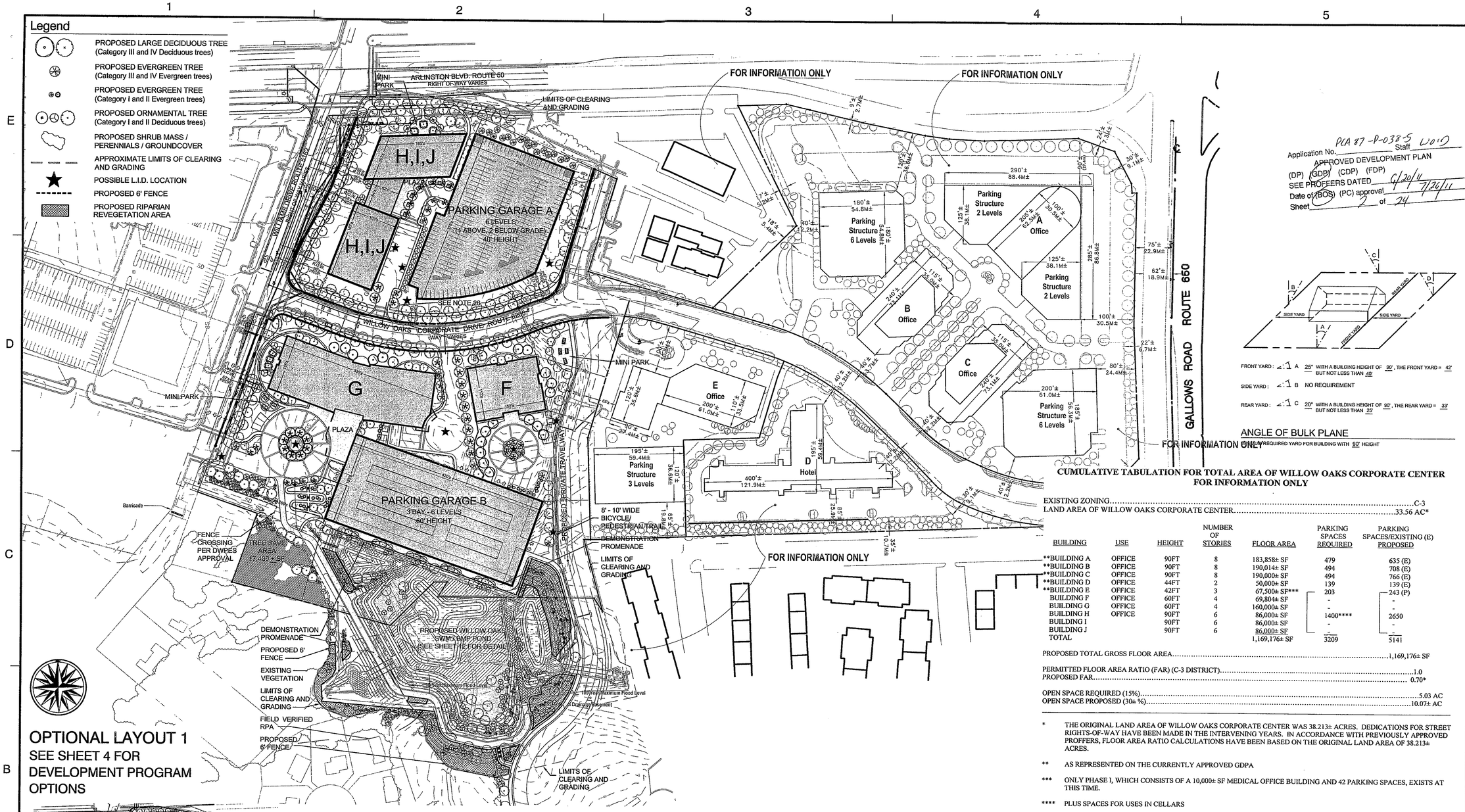
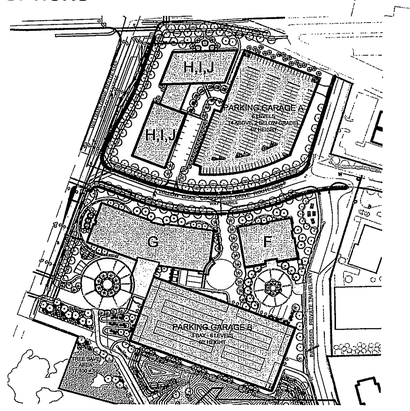
Zoning Evaluation Division

M-10690



OPTIONAL LAYOUT 1

SEE SHEET 4 FOR DEVELOPMENT PROGRAM OPTIONS



Interior Parking Lot Landscaping Graphic

Not to Scale

Parking Lot Landscaping Tabulation

PARKING LOT AREA .....173,635 SF±
PARKING LOT LANDSCAPING REQUIRED (5%) ..... 8,682 SF±
PARKING LOT LANDSCAPING PROPOSED (5.2%) .....9,100 SF±
(52 PROPOSED TREES @ AVG. 175 SF EA)

TREE COUNTED TOWARD PARKING LOT LANDSCAPING REQUIREMENT

Tree Canopy Tabulation

SITE AREA.....703,058 SF±
POND WATER SURFACE ELEVATION (ON WILLOW OAKS SITE).....18,849 SF±
ADJUSTED SITE AREA.....684,209 SF±
TREE CANOPY REQUIRED (10%).....68,421 SF±
AREA OF EXISTING TREES (17,400 x1.25).....21,750 SF±
AREA OF TREES PLANTED ON SITE:
163 TREES @ AVG. 175 SF EA = 28,525;
34 TREES @ AVG. 125 SF EA = 4,250;
101 TREES @ AVG. 75 SF EA = 7,575;
109 TREES @ AVG. 60 SF EA = 6,540
AREA OF PROPOSED LANDSCAPING.....46,890 SF±
TOTAL TREE CANOPY PROVIDED (10%).....68,640 SF±

NOTE:

THE PARKING LOT LANDSCAPING AND TREE CANOPY TABULATIONS ARE PRELIMINARY. THE TABULATIONS ARE INTENDED TO REFLECT THE MINIMUM LANDSCAPE AND CANOPY REQUIREMENTS FOR THE PROPOSED DEVELOPMENT PROGRAM. FINAL CALCULATIONS WILL BE PROVIDED WITH THE BENEFIT OF SURVEYS AND FINAL ENGINEERING AT TIME OF SITE PLAN PREPARATION. AT TIME OF SITE PLAN, INDIVIDUAL TREES IDENTIFIED MAY VARY AND/OR ADDITIONAL TREES MAY BE IDENTIFIED AS CONTRIBUTING TOWARDS MEETING THE LANDSCAPE REQUIREMENT AND/OR ADDITIONAL TREE CANOPY MAY BE CLAIMED FOR EXISTING TREES WITH LARGER CALIPER/TREE COVERAGE.

RPA Revegetation

DISTURBED RPA AREA.....34,472.53 SF± (.79 ACRES)

REQUIRED DENSITY OF DECIDUOUS TREES.....100 PER ACRE
REQUIRED DENSITY OF UNDERSTORY TREES.....200 PER ACRE
REQUIRED DENSITY OF SHRUBS.....1089 PER ACRE

PROPOSED DENSITY OF DECIDUOUS TREES AT SITE PLAN: 79
PROPOSED DENSITY OF UNDERSTORY TREES AT SITE PLAN: 158
PROPOSED DENSITY OF SHRUBS AT SITE PLAN: 860

Application No. PCA 87-P-038-5 Staff WOID
APPROVED DEVELOPMENT PLAN
(DP) (GDP) (CDP) (FDP)
SEE PROFFERS DATED 6/20/11
Date of (BOS) (PC) approval 7/26/11
Sheet 2 of 24

FRONT YARD: ≤ 1 A 25' WITH A BUILDING HEIGHT OF 90', THE FRONT YARD = 42' BUT NOT LESS THAN 40'

SIDE YARD: ≤ 1 B NO REQUIREMENT

REAR YARD: ≤ 1 C 20' WITH A BUILDING HEIGHT OF 90', THE REAR YARD = 33' BUT NOT LESS THAN 25'

ANGLE OF BULK PLANE
MINIMUM REQUIRED YARD FOR BUILDING WITH 90' HEIGHT

CUMULATIVE TABULATION FOR TOTAL AREA OF WILLOW OAKS CORPORATE CENTER FOR INFORMATION ONLY

EXISTING ZONING.....C-3
LAND AREA OF WILLOW OAKS CORPORATE CENTER.....33.56 AC*

BUILDING	USE	HEIGHT	NUMBER OF STORIES	FLOOR AREA	PARKING SPACES REQUIRED	PARKING SPACES/EXISTING (E) PROPOSED
**BUILDING A	OFFICE	90FT	8	183,858± SF	479	635 (E)
**BUILDING B	OFFICE	90FT	8	190,014± SF	494	708 (E)
**BUILDING C	OFFICE	90FT	8	190,000± SF	494	766 (E)
**BUILDING D	OFFICE	44FT	2	50,000± SF	139	139 (E)
**BUILDING E	OFFICE	42FT	3	67,500± SF***	203	243 (P)
BUILDING F	OFFICE	60FT	4	69,804± SF	-	-
BUILDING G	OFFICE	60FT	4	160,000± SF	-	-
BUILDING H	OFFICE	90FT	6	86,000± SF	1400****	2650
BUILDING I		90FT	6	86,000± SF	-	-
BUILDING J		90FT	6	86,000± SF	-	-
TOTAL				1,169,176± SF	3209	5141

PROPOSED TOTAL GROSS FLOOR AREA.....1,169,176± SF

PERMITTED FLOOR AREA RATIO (FAR) (C-3 DISTRICT).....1.0
PROPOSED FAR..... 0.70*

OPEN SPACE REQUIRED (15%).....5.03 AC
OPEN SPACE PROPOSED (30± %).....10.07± AC

* THE ORIGINAL LAND AREA OF WILLOW OAKS CORPORATE CENTER WAS 38.213± ACRES. DEDICATIONS FOR STREET RIGHTS-OF-WAY HAVE BEEN MADE IN THE INTERVENING YEARS. IN ACCORDANCE WITH PREVIOUSLY APPROVED PROFFERS, FLOOR AREA RATIO CALCULATIONS HAVE BEEN BASED ON THE ORIGINAL LAND AREA OF 38.213± ACRES.

** AS REPRESENTED ON THE CURRENTLY APPROVED GDPA

*** ONLY PHASE I, WHICH CONSISTS OF A 10,000± SF MEDICAL OFFICE BUILDING AND 42 PARKING SPACES, EXISTS AT THIS TIME.

**** PLUS SPACES FOR USES IN CELLARS

TABLE 12.3 TREE PRESERVATION TARGET CALCULATION

	REQUIREMENTS	RESULTS
A	PRE-DEVELOPMENT AREA OF EXISTING TREE CANOPY (FROM EXISTING VEGETATION MAP) =	378,186.13 SF OR 8.68 AC
B	PERCENTAGE OF GROSS SITE AREA COVERED BY EXISTING TREE CANOPY =	53.79%
C	PERCENTAGE OF 10-YEAR TREE CANOPY REQUIRED FOR SITE (SEE LEFT) =	10% OF 626,842 SF = 62,684 SF
D	PERCENTAGE OF THE 10-YEAR CANOPY REQUIREMENT THAT SHOULD BE MET THROUGH TREE PRESERVATION =	53.79% = 33,718 SF
E	PROPOSED PERCENTAGE OF CANOPY REQUIREMENT THAT WILL BE MET THROUGH TREE PRESERVATION (SEE LEFT) =	27.76% = 17,400 SF
F	HAS THE TREE PRESERVATION TARGET MINIMUM BEEN MET?	NO
G	IF NO FOR LINE F, THEN REQUEST A DEVIATE FROM THE TREE PRESERVATION TARGET SHALL BE PROVIDED ON THE PLAN THAT STATES ONE OF MORE OF THE JUSTIFICATIONS LISTING IN 12-0507.3 ALONG WITH A NARRATIVE THAT PROVIDES A SITE-SPECIFIC EXPLANATION OF WHY THE TREE PRESERVATION TARGET CANNOT BE MET. PROVIDE A SHEET NUMBER WHERE THE DEVIATION REQUEST IS LOCATED.	
H	IF STEP G REQUIRES A NARRATIVE, IT SHALL BE PREPARED IN ACCORDANCE WITH 12-0507.4	
I	PLACE THIS INFORMATION PRIOR TO THE 10-YEAR TREE CANOPY CALCULATIONS AS PER INSTRUCTIONS IN TABLE 12.12	

AS APPROVED BY THE BOARD OF SUPERVISORS ON JULY 13, 2009

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INOVA
WILLOW OAKS

PARTIAL GENERALIZED DEVELOPMENT PLAN AMENDMENT
PROVIDENCE DISTRICT
FAIRFAX COUNTY, VIRGINIA

SEAL
COMMONWEALTH OF VIRGINIA
TIMOTHY CHARLES CULLETON
Lic. No. 20112
6/10/09
PROFESSIONAL ENGINEER

KEY PLAN
COMMONWEALTH OF VIRGINIA
EDMOND J. IGNACIO
Lic. No. 33579
6/23/11
PROFESSIONAL ENGINEER

SCALE
0' 100' 200'

No.	DATE	BY	Description
10	06.10.09	ARW	
9	06.05.09	ARW	
8	05.20.09	ARW	
7	04.20.09	ARW	
6	03.26.09	ARW	
5	02.19.09	ARW	
4	01.23.09	ARW	
3	10.09.08	ARW	
2	08.28.08	ARW	
1	07.31.08	ARW	

REVISIONS

DRAWN BY JMC
APPROVED BY
CHECKED BY PGY
DATE April 14, 2008

TITLE
Inova
Willow Oaks
Partial Generalized Development Plan Amendment
Overall

PROJECT NO.

2

SHEET NO. 2 OF 20

M-10690

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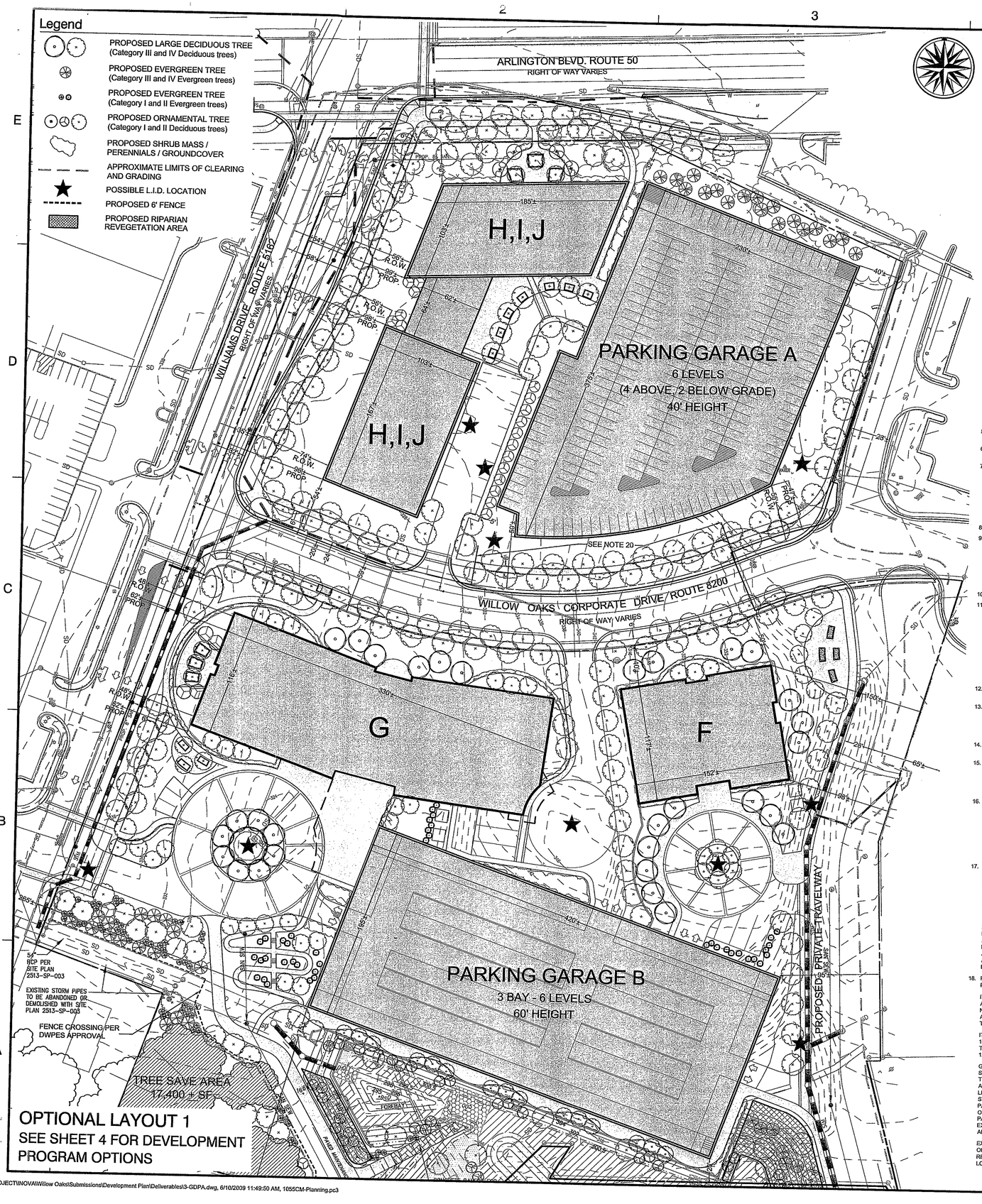

NOTES:

1. THE PROPERTY THAT IS THE SUBJECT OF THIS PARTIAL GENERALIZED DEVELOPMENT PLAN AMENDMENT (GDPA) IS IDENTIFIED ON THE FAIRFAX COUNTY ZONING MAP AS 49-3 001 141. THE LAND AREA IS APPROXIMATELY 16.14 ACRES. IT IS ZONED TO THE C-3 DISTRICT. IT IS PART OF THE APPLICATION RZ 87-P-038 THAT WAS PROFFERED AND APPROVED BY THE BOARD OF SUPERVISORS ON MAY 1, 1989. RZ-87-P-038 WAS THE SUBJECT OF A PROFFERED CONDITION AMENDMENT (PCA) THAT WAS APPROVED ON AUGUST 5, 1996; A SECOND PCA (PCA 87-P-038-02) THAT WAS APPROVED ON AUGUST 2, 1999; AND A THIRD PCA (PCA 87-P-038-03) THAT WAS APPROVED ON OCTOBER 25, 1999.

2. THIS PARTIAL GDPA ACCOMPANIES A PARTIAL PCA THAT HAS BEEN FILED TO AMEND THE CURRENTLY APPROVED DEVELOPMENT PROGRAM FOR PARCEL 141, WHICH PARCEL IS OWNED BY INOVA HEALTH SYSTEM.

   THE CURRENTLY APPROVED DEVELOPMENT PROGRAM FOR PARCEL 141 CONSISTS OF THREE (3) PROPOSED OFFICE BUILDINGS (BLDGS F, G AND H) AND ONE (1) PROPOSED ASSISTED LIVING FACILITY (MEDICAL CARE FACILITY) IN BUILDING I. THE TOTAL APPROVED GROSS FLOOR AREA FOR THESE FOUR (4) BUILDINGS IS 487,804 SQUARE FEET - WHICH APPROXIMATES A 0.69 FAR FOR THE SUBJECT PARCEL.

   THE PROPOSED REVISED DEVELOPMENT PROGRAM FOR THE SUBJECT PROPERTY WILL BE FOUR (4) BUILDINGS (BUILDINGS F, H, I, J) THAT MAY BE USED FOR OFFICES, MEDICAL OFFICES, EDUCATIONAL FACILITY (SCHOOL OF SPECIAL EDUCATION) AND/OR A CANCER CENTER (OFFICE). A FIFTH (5) PROPOSED BUILDING (BUILDING G), CONSISTING OF UP TO 160,000 SQUARE FEET OF GROSS FLOOR AREA, MAY BE USED FOR A PUBLIC USE AND RELATED ACCESSORY SERVICE USES AS DESCRIBED IN THE PROFFERS.

   IF BUILDING G IS NOT USED FOR A MID-COUNTY COMMUNITY SERVICES CENTER, IT IS TO BE UNDERSTOOD BUILDING G MAY BE USED FOR THE SAME USES AS IDENTIFIED ABOVE FOR BUILDING F, H, I, AND J.

   IT IS TO BE NOTED THERE WILL BE NO ASSISTED LIVING FACILITY AND THERE WILL BE NO INCREASE IN THE CURRENTLY APPROVED GROSS FLOOR AREA (GFA) FOR THE SUBJECT PARCEL. THE COMBINED TOTAL GFA WILL REMAIN AT 487,804 SQUARE FEET.

   AS REPRESENTED ON SHEETS 3 AND 4, THERE ARE THREE (3) OPTIONAL DEVELOPMENT PROGRAMS PROPOSED FOR THE NORTHERN LANDBAY OF THE SUBJECT PROPERTY, AND THERE ARE TWO (2) OPTIONAL DEVELOPMENT PROGRAMS PROPOSED FOR THE SOUTHERN LANDBAY. EACH OPTIONAL DEVELOPMENT PROGRAM WILL BE LIMITED TO THE TOTAL 487,804 SQUARE FEET OF GROSS FLOOR AREA. IT IS TO BE UNDERSTOOD THAT THE OPTION 4 DEVELOPMENT PROGRAM COULD BE DEVELOPED WITH EITHER OF THE OPTION 1, 2, OR 3 DEVELOPMENT PROGRAMS FOR THE NORTHERN LANDBAY.

   LASTLY THE APPLICANT RESERVES THE RIGHT TO RELOCATE ABOVE GRADE PARKING SHOWN ON THE GDPA TO A SUBSURFACE LOCATION PROVIDED THAT THE BUILDING HEIGHTS AND FOOTPRINTS OF BUILDING F, G, H, I AND J REMAIN IN SUBSTANTIAL CONFORMANCE WITH THOSE REPRESENTED ON THE GDPA.

3. THE GDPA GRAPHIC FOR THE REMAINDER OF THE WILLOW OAKS CORPORATE CENTER LAND AREA THAT WAS ORIGINALLY APPROVED WITH RZ 87-P-038 IS A REPRESENTATION OF THE CURRENTLY APPROVED DEVELOPMENT PLANS FOR THE REMAINDER OF THE WILLOW OAKS CORPORATE CENTER SITE. THERE IS NO CHANGE PROPOSED FOR THE REMAINDER OF THE SITE.

4. AS NOTED ABOVE, THE PRINCIPAL USE OF BUILDINGS F, H, I AND J AS REPRESENTED ON THE GRAPHIC WILL BE OFFICE/MEDICAL OFFICE/EDUCATIONAL/CANCER CENTER, AND THE PRINCIPAL USE OF BUILDING G MAY BE EITHER ONE OR A COMBINATION OF THESE USES OR PUBLIC USE. IT IS TO BE UNDERSTOOD THAT ACCESSORY SERVICE USES AS PRESCRIBED BY THE PROVISIONS SET FORTH IN PART 2 OF ARTICLE 10 OF THE ZONING ORDINANCE MAY ALSO BE ESTABLISHED IN THE PROPOSED BUILDINGS, AND THAT SPECIAL EXCEPTION AND SPECIAL PERMIT USES ALLOWED IN THE C-3 DISTRICT MAY ALSO BE ESTABLISHED SUBJECT TO APPROPRIATE APPROVALS WITHOUT THE NECESSITY OF FILING FOR A RELATED PROFFERED CONDITION AMENDMENT.

5. THE BOUNDARY INFORMATION SHOWN ON THE GRAPHIC FOR THE LIMITED AREA OF THE GDPA IS FROM A SURVEY PREPARED BY DEWBERRY AND DAVIS.

6. THE TOPOGRAPHIC INFORMATION SHOWN ON THE GRAPHIC FOR THE LIMITED AREA OF THE GDPA IS AT A CONTOUR INTERVAL OF TWO (2) FEET FROM BOTH AERIAL AND FIELD SURVEY.

7. TO THE BEST OF OUR KNOWLEDGE, WITHIN THE AREA OF THE PARTIAL GDPA, THERE ARE NO EXISTING UTILITY EASEMENTS HAVING A WIDTH OF TWENTY-FIVE (25) FEET OR MORE OR NO MAJOR UNDERGROUND UTILITY EASEMENTS REGARDLESS OF WIDTH.

   IT IS TO BE NOTED THERE IS A TEMPORARY CONSERVATION EASEMENT THAT HAS BEEN RECORDED ON THE SUBJECT PROPERTY FOR THE PURPOSE OF PROVIDING AN INTERIM BEST MANAGEMENT PRACTICE (BMP) FOR THE ADJACENT LIFE WITH CANCER DEVELOPMENT PROGRAM TO THE WEST. THIS CONSERVATION EASEMENT WILL BE VACATED WITH THE APPROVAL OF THE COUNTY WHEN IT CAN BE DEMONSTRATED THAT THE BMP REQUIREMENT IS OTHERWISE ACCOMMODATED.

8. THE SUBJECT PROPERTY IS SERVED BY PUBLIC WATER AND SEWER.

9. THE MINIMUM YARD REQUIREMENTS SET FORTH IN THE ZONING ORDINANCE FOR THE C-3 DISTRICT ARE AS FOLLOWS (IT IS TO BE NOTED THAT THERE IS NO MINIMUM YARD REQUIREMENT ADJACENT TO THE PROPOSED CONNECTOR TRAVELWAY):

   FRONT YARD: CONTROLLED BY A 25º ANGLE OF BULK PLANE, BUT NOT LESS THAN 40 FEET.

   SIDE YARD:NO REQUIREMENT

   REAR YARD: CONTROLLED BY A 20º ANGLE OF BULK PLANE, BUT NOT LESS THAN 25 FEET.

10. TO THE BEST OF OUR KNOWLEDGE, THERE ARE NO GRAVES LOCATED ON THE SUBJECT PROPERTY.

11. THERE IS NO FLOODPLAIN DESIGNATED BY THE FEDERAL EMERGENCY MANAGEMENT AGENCY OR UNITED STATES GEOLOGICAL SURVEY LOCATED ON THE SUBJECT PROPERTY. FAIRFAX COUNTY DOES DESIGNATE A MINOR FLOODPLAIN AND RESOURCE PROTECTION AREA (RPA) ON THE SUBJECT PROPERTY IN THE LOCATION OF THE PROPOSED SWM/BMP POND (SEE NOTE 17). A WATER QUALITY IMPACT ASSESSMENT WILL BE FILED AT SITE PLAN TO ADDRESS PROPOSED IMPROVEMENTS IN THE RPA. IN ADDITION, A FLOODPLAIN STUDY WILL BE FILED AT SITE PLAN TO ADDRESS THE PROPOSED IMPROVEMENTS IN THE MINOR FLOODPLAIN.

    IT IS TO BE NOTED THAT THE RPA REPRESENTED ON THE GRAPHIC IS THE FIELD VERIFIED RPA. IT IS BASED ON AN RPA DELINEATION STUDY BEING PREPARED AND PROCESSED UNDER SEPARATE COVER.

12. OTHER THAN THE EXISTING VEGETATION, THERE ARE NO SCENIC ASSETS OR NATURAL FEATURES DESERVING OF PROTECTION OR PRESERVATION ON THE SUBJECT PROPERTY.

13. THERE ARE NO EXISTING BUILDINGS LOCATED IN THE AREA OF THE PARTIAL GDPA (SUBJECT PROPERTY). THERE ARE FIVE (5) EXISTING BUILDINGS IN THE REMAINING AREA OF THE WILLOW OAKS CORPORATE CENTER THAT IS OUTSIDE THE LIMITS OF THE PARTIAL GDPA. THEY ARE BUILDINGS A, B, C, D AND E. THEY WERE CONSTRUCTED IN 2001, 1986, 1988, 1998 AND 1995, RESPECTIVELY. THEY WILL BE RETAINED.

14. A STATEMENT CONFIRMING THE OWNERSHIP OF THE SUBJECT PROPERTY AND THE APPLICANT'S INTEREST IN SAME IS PROVIDED IN A SEPARATE DOCUMENT.

15. THE SUBJECT PROPERTY IS LOCATED IN SUB-UNIT L5 OF THE MERRIFIELD SUBURBAN CENTER COMPONENT OF THE FAIRFAX COUNTY COMPREHENSIVE PLAN. THE PROPOSED DEVELOPMENT PROGRAM IS IN ACCORDANCE WITH THE LAND USE RECOMMENDATIONS SET FORTH FOR SUB-UNIT L5. AS SUCH, THERE SHOULD BE NO ADVERSE EFFECTS ON ADJACENT OR NEIGHBORING PROPERTIES FROM THE PROPOSED DEVELOPMENT PROGRAM.

16. TO THE BEST OF OUR KNOWLEDGE, THE PROPOSED USE(S) WILL NOT GENERATE, UTILIZE, STORE, TREAT OR DISPOSE OF HAZARDOUS AND TOXIC SUBSTANCES AS SET FORTH IN TITLE 40, CODE OF FEDERAL REGULATIONS PARTS 116.4, 302.4 AND 355; HAZARDOUS WASTE AS SET FORTH IN VIRGINIA DEPARTMENT OF ENVIRONMENTAL QUALITY HAZARDOUS WASTE MANAGEMENT REGULATIONS; AND/OR PETROLEUM PRODUCTS AS DEFINED IN TITLE 40, CODE OF FEDERAL REGULATIONS PART 280. TO THE BEST OF OUR KNOWLEDGE AND UNDERSTANDING, HOWEVER, ANY SUCH SUBSTANCE THAT MAY BE UTILIZED, STORED AND/OR DISPOSED OF IN CONJUNCTION WITH THE USE(S) AND THE MAINTENANCE OF THE PROPOSED BUILDINGS AND GROUNDS WILL BE IN ACCORDANCE WITH SAID REGULATIONS.

17. STORMWATER MANAGEMENT (SWM) AND BEST MANAGEMENT PRACTICES (BMPS) FOR THE PROPOSED DEVELOPMENT PROGRAM WILL BE PROVIDED IN THE PROPOSED WILLOW OAKS SWM/BMP POND LOCATED IN PART ON THE SOUTHERN EDGE OF THE SUBJECT PROPERTY. THE PROPOSED WILLOW OAKS SWM/BMP POND WILL BE THE SUBJECT OF A MAJOR ENLARGEMENT/ENHANCEMENT PROJECT THAT IS PLANNED IN CONCERT WITH THE PROPOSED DEVELOPMENT PROGRAM. A MORE DETAILED STATEMENT AND ANALYSIS OF THE SWM/BMP PLAN IS PRESENTED ON SHEETS 10 THROUGH 18.

    THE APPLICANT WILL INSTALL FAIRFAX COUNTY ACCEPTED LOW IMPACT DEVELOPMENT (LID) FACILITIES ON THE APPLICATION PROPERTY IN AT LEAST ONE OF THE POSSIBLE LOCATIONS AS REPRESENTED ON THE GRAPHIC. THE LID FACILITIES (PERVIOUS PAVEMENT OR OTHER) WILL TREAT A TOTAL OF 20,000 SQUARE FEET OF IMPERVIOUS SURFACE AND WILL HAVE A MINIMUM PHOSPHOROUS REMOVAL EFFICIENCY OF 40 PERCENT. THE LID FACILITIES WILL BE DESIGNED IN ACCORDANCE WITH THE PFM. THESE LID FACILITIES ARE INTENDED AS DEMONSTRATION FACILITIES AND WILL NOT FACTOR INTO THE REQUISITE CALCULATIONS FOR STORMWATER MANAGEMENT AND BMPS.

18. PARKING AND LOADING SPACES WILL BE PROVIDED ON SITE IN ACCORDANCE WITH THE APPLICABLE PROVISIONS IN THE ZONING ORDINANCE.

    IT IS TO BE UNDERSTOOD THAT THE TOTAL NUMBER OF PARKING SPACES PROVIDED MAY BE ADJUSTED IN ACCORDANCE WITH THE FINAL DEVELOPMENT PROGRAM AS LONG AS THE MINIMUM NUMBER OF PARKING SPACES PROVIDED IS IN ACCORDANCE WITH THE PROVISIONS SET FORTH IN ARTICLE 11 OF THE ZONING ORDINANCE AND THE OPEN SPACE PROVIDED AS SET FORTH IN THE TABULATION AND THE MINIMUM DIMENSIONS TO THE PERIPHERAL LOT LINES ARE NOT DIMINISHED.

    IT IS TO BE FURTHER UNDERSTOOD THAT, IN ACCORDANCE WITH THE PROVISION SET FORTH IN PAR 1 OF SECT. 11-102 OF THE ZONING ORDINANCE, EIGHT (8) PARKING SPACES WILL BE PROVIDED ON THE SUBJECT PROPERTY TO SERVE THE EXISTING OFFICE BUILDING LOCATED ON PARCEL 49-3 001 128.

    GIVEN THAT THE PROPOSED NUMBER OF PARKING SPACES ON THE SITE EXCEEDS THE NUMBER OF SPACES REQUIRED BY THE PROVISIONS OF THE ZONING ORDINANCE, THE APPLICANT RESERVES THE RIGHT TO REDUCE THE NUMBER OF PARKING SPACES ON THE SITE WITHOUT A PCA OR ADMINISTRATIVE INTERPRETATION TO ALLOW FOR MINOR ENGINEERING ISSUES SUCH AS, BUT NOT LIMITED TO, RESTRIPING PARKING LOTS, STORAGE, CONSTRUCTION EQUIPMENT/TRAILERS, INTERIM STORMWATER MANAGEMENT PONDS, ETC. IN NO EVENT, HOWEVER, WILL THE TOTAL NUMBER OF PARKING SPACES ON THE ENTIRE SITE BE REDUCED BELOW THAT REQUIRED BY THE PROVISIONS OF THE ZONING ORDINANCE. FURTHERMORE, IT IS TO BE UNDERSTOOD THAT THE NUMBER OF PARKING SPACES MAY BE REDUCED IN NUMBER TO ACCOMMODATE FUTURE EXPANSIONS/ADDITIONS TO THE BUILDINGS, AS MAY BE APPROVED WITH FUTURE PCA APPLICATIONS, AS LONG AS IT CAN BE DEMONSTRATED THAT ADEQUATE PARKING IS PROVIDED.

    EXPERIENCE HAS INDICATED THAT THE LOADING SPACE REQUIREMENT SET FORTH IN ARTICLE 11 OF THE ZONING ORDINANCE IS EXCESSIVE FOR OFFICE USES. GIVEN THIS EXPERIENCE FACTOR, A LOADING SPACES FOR EACH BUILDING ON EACH OF THE OPTIONAL DEVELOPMENT PROGRAMS.

19. IT IS TO BE UNDERSTOOD THAT THE PROPOSED PARKING GARAGE AND BUILDING SITES REPRESENTED ON THE GRAPHIC MAY BE USED AS INTERIM SURFACE PARKING LOTS TO SERVE THE PROPOSED USES ON THE SITE AND FOR CONSTRUCTION ON THE ADJACENT INOVA FAIRFAX HOSPITAL CAMPUS SITE.

20. LANDSCAPING AND SCREENING WILL BE PROVIDED IN ACCORDANCE WITH THAT REPRESENTED ON THE GRAPHIC; IN ACCORDANCE WITH THE APPLICABLE PROVISIONS OF ARTICLE 13 OF THE ZONING ORDINANCE; IN ACCORDANCE WITH CHAPTER 122, TREE CONSERVATION ORDINANCE; AND IN ACCORDANCE WITH THE STREETSCAPE GUIDELINES THAT ARE SET FORTH IN THE MERRIFIELD SUBURBAN CENTER COMPONENT OF THE COMPREHENSIVE PLAN. THE INTERIOR PARKING LOT LANDSCAPING, PERIPHERAL PARKING LOT LANDSCAPING, TRANSITIONAL SCREENING AND TREE CANOPY CALCULATIONS THAT ARE PRESCRIBED BY THE PROVISIONS OF CHAPTER 122 AND ARTICLE 13 OF THE ZONING ORDINANCE WILL BE PROVIDED WITH THE SUBMISSION OF THE SITE PLAN(S) FOR THE SUBJECT DEVELOPMENT PROGRAM.

    THE LANDSCAPING REPRESENTED ON THE GRAPHIC IS ILLUSTRATIVE ONLY AND REPRESENTS THE LEVEL OF QUANTITY AND QUALITY OF LANDSCAPING THAT IS PROPOSED. THE ACTUAL LOCATION, DETAILED LANDSCAPE PLANS TO BE PREPARED AND SUBMITTED IN CONJUNCTION WITH THE SITE PLAN(S). AS IDENTIFIED ON SHEETS 2, 3, AND 4, THERE IS A SECTION ALONG THE NORTH SIDE OF SUBJECT TO ADJUSTMENT IN ORDER TO SATISFY ADEQUATE SIGHT DISTANCE STANDARDS. ANY NEEDED ADJUSTMENT WILL BE ADDRESSED AT TIME OF SITE PLAN WHEN MORE DETAILED INFORMATION IS AVAILABLE.

    IN ACCORDANCE WITH THE PRIOR APPROVALS, IN THAT AREA OF WILLOW OAKS CORPORATE CENTER THAT IS OUTSIDE OF THE SUBJECT PARTIAL GDPA, A WAIVER OF THE TRANSITIONAL SCREENING YARD AND BARRIER THAT IS REQUIRED ALONG THAT SECTION OF THE SOUTHERN PROPERTY LINE EAST OF BUILDING D WHERE WILLOW OAKS CORPORATE DRIVE IS ADJACENT AND PARALLEL TO THE SOUTHERN PROPERTY BOUNDARY IS REAFFIRMED.

    TO THE WEST OF BUILDING G, WITHIN THE AREA OF THE PARTIAL GDPA, THERE IS A TRANSITIONAL SCREENING YARD 2 AND BARRIER REQUIRED ALONG THE SOUTHERN PROPERTY LINE. GIVEN THE EXISTING AND PROPOSED UTILITY EASEMENTS IN THE VICINITY OF THIS PROPERTY LINE, REQUEST IS HEREBY MADE FOR A MODIFICATION OF THE TRANSITIONAL SCREENING YARD 2 PLANTING SCHEDULE TO ALLOW THE REQUISITE NUMBER OF PLANT MATERIAL TO BE LOCATED OUTSIDE OF THE EXISTING/PROPOSED UTILITY EASEMENT(S).

    THERE ARE NO TRANSITIONAL SCREENING OR BARRIER REQUIREMENTS FOR THE WESTERN, NORTHERN OR EASTERN BOUNDARIES OF THE SUBJECT PROPERTY.

    PRELIMINARY CALCULATIONS SUGGEST THAT IT MAY NOT BE POSSIBLE TO SATISFY THE PRESCRIBED TREE PRESERVATION TARGET COMPONENT OF THE TREE CANOPY REQUIREMENT SET FORTH IN CHAPTER 122 OF THE CODE WITH THE PROPOSED DEVELOPMENT PROGRAM. A DEVIATION FROM THE TREE PRESERVATION TARGET MAY BE REQUESTED FROM THE DIRECTOR OF DPWES AT TIME OF SITE PLAN IN ACCORDANCE WITH THE PROVISION SET FORTH IN SECT. 122-2-3 OF CHAPTER 122.

21. A WAIVER OF THE SERVICE DRIVE ALONG THE FRONTAGE OF ROUTE 50 IS HEREBY REQUESTED PURSUANT TO THE PREVIOUS APPROVAL OF SUCH WAIVER.

22. THE FAIRFAX COUNTY COUNTRYWIDE TRAILS PLAN RECOMMENDS A MINOR PAVED TRAIL ON THE SOUTH SIDE OF ARLINGTON BOULEVARD, ROUTE 50. SUCH A TRAIL WOULD TRAVERSE THE NORTHERN EDGE OF THE SUBJECT PROPERTY. IT IS THE ONLY TRAIL RECOMMENDED WITHIN THE IMMEDIATE VICINITY OF THE SUBJECT PROPERTY.

23. IN ACCORDANCE WITH PRIOR APPROVALS, THE FLOOR AREA RATIO FOR THE TOTAL WILLOW OAKS CORPORATE PARK IS BASED ON THE ORIGINAL LAND AREA OF 38.219± ACRES. THE FLOOR AREA RATIO RELATED TO ALL FUTURE DEDICATIONS IS RESERVED FOR DEVELOPMENT OF THE SUBJECT PROPERTY IN ACCORDANCE WITH THE PROVISIONS SET FORTH IN PAR. 4 OF SECT. 2-308 OF THE ZONING ORDINANCE.

24. THE FLOOR AREAS REPRESENTED IN THE TABULATION ARE GROSS FLOOR AREAS AS DEFINED IN THE FAIRFAX COUNTY ZONING ORDINANCE. IT IS UNDERSTOOD THAT THE BUILDINGS MAY HAVE CELLAR SPACES WHICH SPACES WILL BE CALCULATED FOR OFF-STREET PARKING REQUIREMENTS IN ACCORDANCE WITH THE PROVISIONS SET FORTH IN PAR. 25 OF SECT. 11-102 OF THE ZONING ORDINANCE.

25. THE PROPOSED DEVELOPMENT PROGRAM WILL OCCUR IN PHASES WITH NO CURRENTLY ESTABLISHED BEGINNING OR ENDING DATES. AS NOTED ABOVE, IT IS TO BE UNDERSTOOD THAT DURING THE PHASED CONSTRUCTION, PROPOSED PARKING GARAGE AND BUILDING SITES MAY BE USED FOR INTERIM SURFACE PARKING AREAS FOR THE ADJACENT USES/BUILDINGS ON SITE AND FOR CONSTRUCTION ON THE ADJACENT INOVA FAIRFAX HOSPITAL CAMPUS SITE.

26. THE FOOTPRINTS OF THE BUILDING SHOWN ON THE GRAPHIC MAY BE INCREASED UP TO FIVE (5) PERCENT AS LONG AS THE OPEN SPACE PRESENTED IN THE TABULATION AND THE MINIMUM DISTANCES TO THE PERIPHERAL LOT LINES AS PRESENTED ON THE GRAPHIC ARE NOT DIMINISHED AND AS LONG AS THE RESULTANT PROPOSED DEVELOPMENT IS IN SUBSTANTIAL CONFORMANCE WITH THAT REPRESENTED ON THE GRAPHIC. THE SIZES AND SHAPES AND LOCATIONS OF THE PROPOSED BUILDINGS, STRUCTURES AND IMPROVEMENTS ARE PRELIMINARY AND SUBJECT TO MINOR MODIFICATION WITH FINAL ENGINEERING AND ARCHITECTURAL DESIGN IN ACCORDANCE WITH THE PROVISION SET FORTH IN SECT. 18-204 OF THE ZONING ORDINANCE.

    THE TOTAL GROSS FLOOR AREA AND MAXIMUM BUILDING HEIGHTS PRESENTED IN THE TABULATION ARE TO BE CONSIDERED MAXIMUM AND THE DIMENSIONS TO THE PERIPHERAL LOT LINES PRESENTED ON THE GRAPHIC ARE TO BE DEEMED MINIMUMS WITH THE UNDERSTANDING THAT ALL DIMENSIONS SHOWN ON THE GRAPHIC AND IN THE TABULATION ARE SUBJECT TO MINOR MODIFICATION IN ACCORDANCE WITH THE PROVISION SET FORTH IN SECT. 18-204 OF THE ZONING ORDINANCE. THE FLOOR AREAS OF THE INDIVIDUAL BUILDINGS AS PRESENTED IN THE TABULATION MAY VARY WITH FINAL ARCHITECTURAL DESIGN; HOWEVER, THE TOTAL COMBINED GROSS FLOOR AREA AS PRESENTED IN THE TABULATION WILL NOT BE EXCEEDED. GROSS FLOOR AREAS AND MAXIMUM BUILDING HEIGHTS WILL BE CALCULATED IN ACCORDANCE WITH THE APPLICABLE PROVISIONS IN THE ZONING ORDINANCE.

    LASTLY, THE APPLICANT RESERVES THE RIGHT TO SHIFT GROSS FLOOR AREA THAT IS REPRESENTED ON THE TABULATION FROM ONE BUILDING TO ANOTHER WITH THE UNDERSTANDING THAT THE RESULTANT BUILDING FOOTPRINTS WILL BE IN SUBSTANTIAL CONFORMANCE WITH THE FOOTPRINTS REPRESENTED ON THE GRAPHIC AND THE MAXIMUM TOTAL GROSS FLOOR AREA REPRESENTED IN THE TABULATION WILL NOT BE EXCEEDED.

27. IS TO BE UNDERSTOOD THAT ADDITIONAL SITE FEATURES SUCH AS GAZEBOS, TRELLISES, SIGNS, FLAGPOLES, SIDEWALKS/TRAILS, LIGHT STANDARDS, PASSIVE AND ACTIVE RECREATIONS FACILITIES, WALLS, FENCES, AND /OR UTILITY AND MAINTENANCE STRUCTURES NOT REPRESENTED ON THE GRAPHIC MAY BE PROVIDED AS LONG AS THE RESULTANT PROPOSED DEVELOPMENT IS IN SUBSTANTIAL CONFORMANCE WITH THAT REPRESENTED ON THE GRAPHIC.

    ALL SIGNS WILL BE PROVIDED IN ACCORDANCE WITH THE PROVISIONS SET FORTH IN ARTICLE 12 OF THE ZONING ORDINANCE AND IN ACCORDANCE WITH PRIOR APPROVALS, IT IS ALSO UNDERSTOOD THAT MOBILE AND LAND BASED TELECOMMUNICATION FACILITIES MAY BE PROVIDED ON SITE IN ACCORDANCE WITH THE PROVISIONS SET FORTH IN SECT. 2-514 OF THE ZONING ORDINANCE.

28. TO THE BEST OF OUR KNOWLEDGE, EXCEPT AS QUALIFIED ABOVE, THE PROPOSED DEVELOPMENT OF THE SUBJECT PROPERTY CONFORMS TO ALL CURRENT APPLICABLE LAND DEVELOPMENT ORDINANCES, REGULATIONS AND ADOPTED STANDARDS.

TABULATION FOR AREA OF PARTIAL GDPA OPTION 1

EXISTING/PROPOSED ZONING C-3
LAND AREA OF PARTIAL GDPA ..... 16.14 AC

PROPOSED USE ..... OFFICE/EDUCATIONAL/PUBLIC

PROPOSED GROSS FLOOR AREA (GFA) ..... 487,804+SF

- BUILDING F ..... 69,804± SF
- BUILDING G ..... 160,000± SF
- BUILDING H, I, J ..... 258,000± SF

PROPOSED FLOOR AREA RATIO (FAR) 0.69

MAXIMUM HEIGHT OF BUILDINGS

- BUILDING F ..... 4 STORIES ..... 60 FT
- BUILDING G ..... 4 STORIES ..... 60 FT
- BUILDING H, I, J ..... 6 STORIES ..... 90 FT

PARKING SPACES REQUIRED 1297*

- BUILDING F ..... @ 3.0 SPACES / 1000 SF GFA = 210
- BUILDING G ..... @ 2.6 SPACES / 1000 SF GFA = 416
- BUILDING H, I, J ..... @ 2.6 SPACES / 1000 SF GFA = 671

PARKING SPACES PROPOSED 2430

- PARKING GARAGE A, 6 LEVELS 1,280
- PARKING GARAGE B, 6 LEVELS 1150

OPEN SPACE REQUIRED (15% OF NET LAND AREA) ..... 2.20 AC

OPEN SPACE PROPOSED (43% OF NET LAND AREA) ..... 6.42 AC

* PLUS SPACES FOR USES IN CELLAR. SEE NOTE 24.

Application No. PCA 87-P-038-5 Staff WO'L

APPROVED DEVELOPMENT PLAN

(DP) (GDP) (CDP) (FDP)

SEE PROFFERS DATED 6/20/11

Date of (BOS) (PC) approval 7/26/11

Sheet 3 of 24 7/7/11

AS APPROVED BY THE BOARD OF SUPERVISORS ON JULY 13, 2009

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INOVA
WILLOW OAKS

PARTIAL GENERALIZED
DEVELOPMENT PLAN AMENDMENT

PROVIDENCE DISTRICT
FAIRFAX COUNTY, VIRGINIA

SEAL

COMMONWEALTH OF VIRGINIA
TIMOTHY CHARLES CULLETON
Lic. No. 20112
6·10·09
PROFESSIONAL ENGINEER

KEY PLAN

COMMONWEALTH OF VIRGINIA
EDMUND J. IGNACIO
Lic. No. 33579
4/27/11
PROFESSIONAL ENGINEER

SCALE
0' 50' 100'

No.	DATE	BY	Description
10	06.10.09	ARW	
9	06.05.09	ARW	
8	05.20.09	ARW	
7	04.20.09	ARW	
6	03.26.09	ARW	
5	02.19.09	ARW	
4	01.23.09	ARW	
3	10.09.08	ARW	
2	08.28.08	ARW	
1	07.31.08	ARW	

REVISIONS

DRAWN BY JMC
APPROVED BY
CHECKED BY PGY
DATE April 14, 2008

TITLE
Inova
Willow Oaks
Partial Generalized Development Plan Amendment

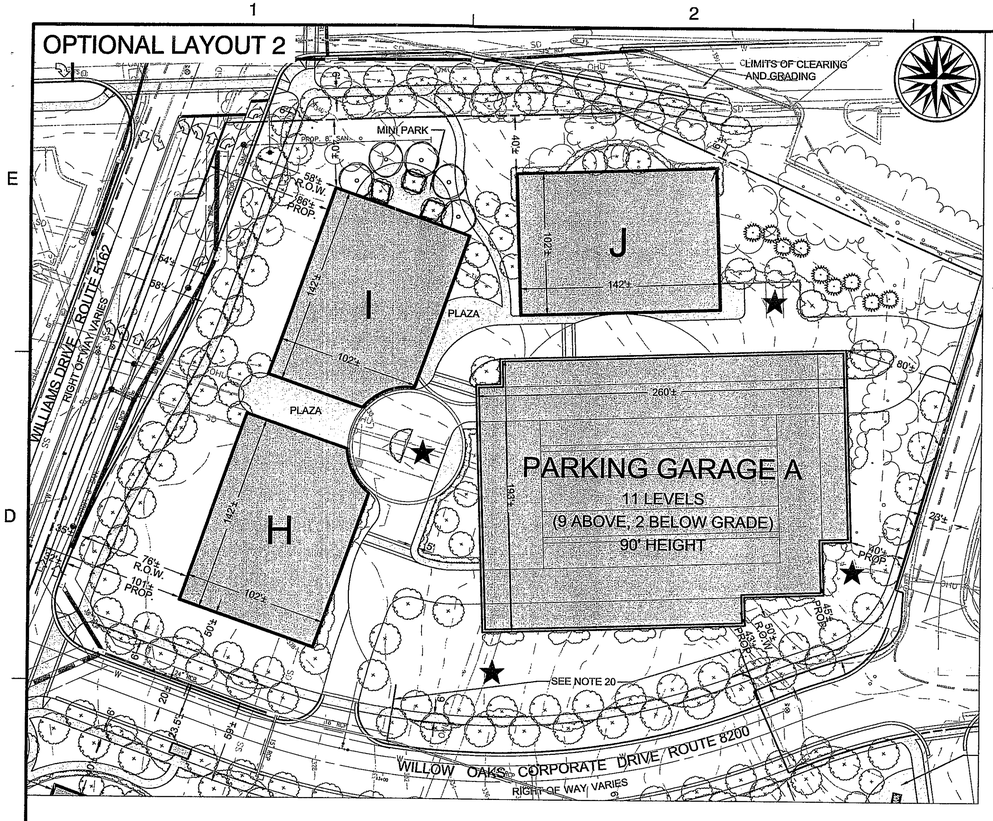
PROJECT NO.

3

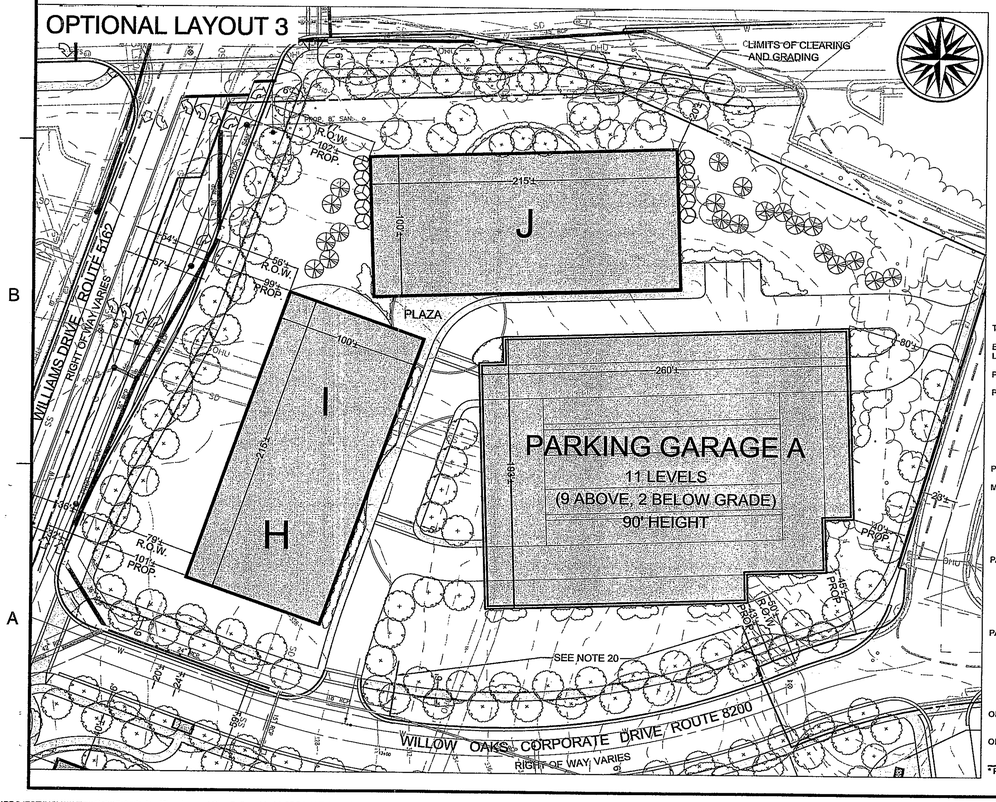
SHEET NO. 3 OF 20

M-10690

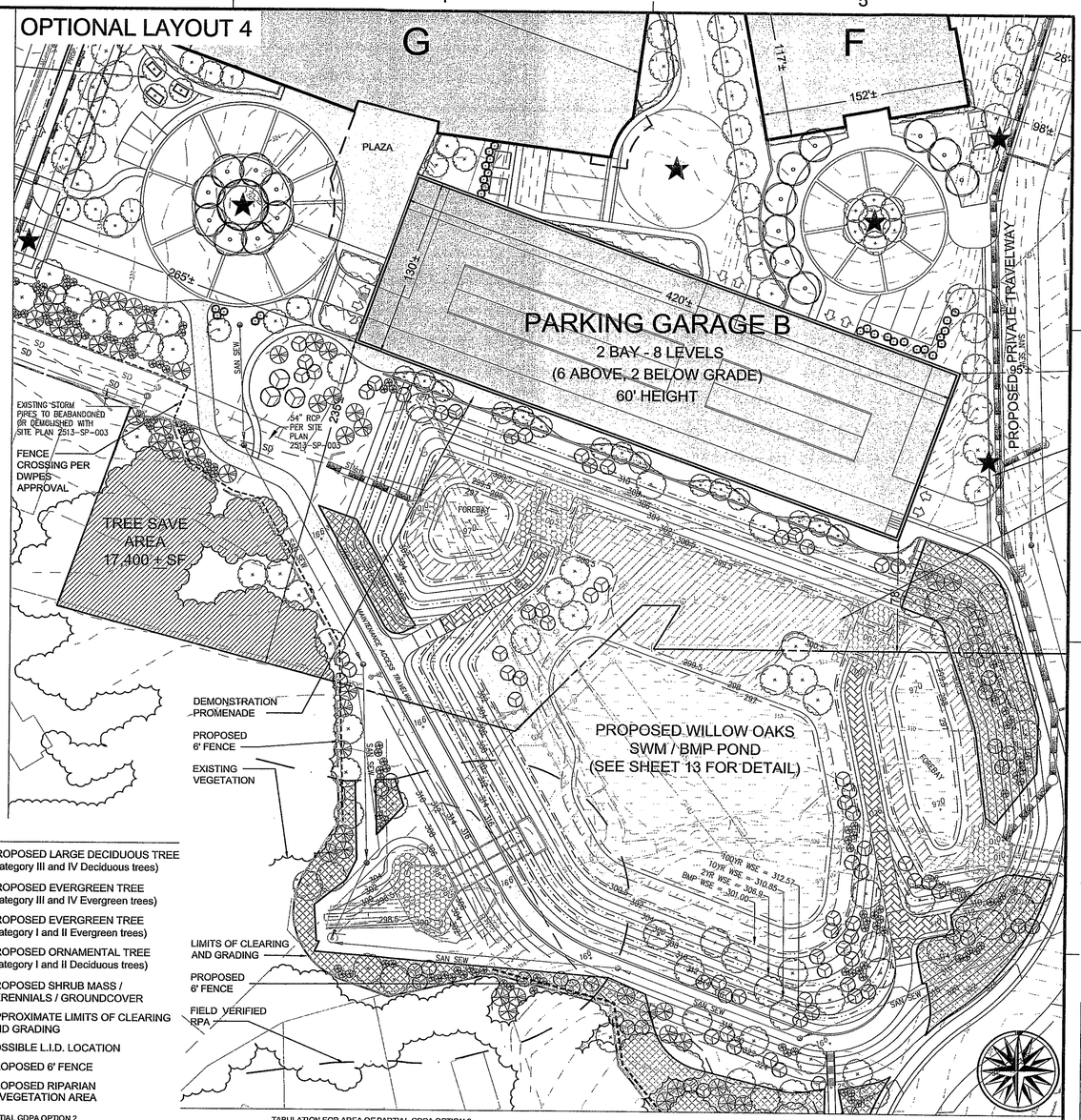
OPTIONAL LAYOUT 2



OPTIONAL LAYOUT 3



OPTIONAL LAYOUT 4



Legend

- PROPOSED LARGE DECIDUOUS TREE (Category III and IV Deciduous trees)
- PROPOSED EVERGREEN TREE (Category III and IV Evergreen trees)
- PROPOSED EVERGREEN TREE (Category I and II Evergreen trees)
- PROPOSED ORNAMENTAL TREE (Category I and II Deciduous trees)
- PROPOSED SHRUB MASS / PERENNIALS / GROUNDCOVER
- APPROXIMATE LIMITS OF CLEARING AND GRADING
- POSSIBLE L.I.D. LOCATION
- PROPOSED 6' FENCE
- PROPOSED RIPARIAN REVEGETATION AREA

TABULATION FOR AREA OF PARTIAL GDPA OPTION 2

EXISTING/PROPOSED ZONING C-3
LAND AREA OF PARTIAL GDPA ..... 16.14 AC

PROPOSED USE ..... OFFICE/EDUCATIONAL/PUBLIC

PROPOSED GROSS FLOOR AREA (GFA) ..... 487,804+SF

- BUILDING F ..... 69,804± SF
- BUILDING G ..... 160,000± SF
- BUILDING H ..... 86,000± SF
- BUILDING I ..... 86,000 ± SF
- BUILDING J ..... 86,000 ± SF

PROPOSED FLOOR AREA RATIO (FAR) 0.69

MAXIMUM HEIGHT OF BUILDINGS

- BUILDING F ..... 4 STORIES ..... 60 FT
- BUILDING G ..... 4 STORIES ..... 60 FT
- BUILDING H ..... 7 STORIES ..... 90 FT
- BUILDING I ..... 7 STORIES ..... 90 FT
- BUILDING J ..... 7 STORIES ..... 90 FT

PARKING SPACES REQUIRED 1400*

- BUILDING F ..... @ 3.0 SPACES / 1000 SF GFA = 210
- BUILDING G ..... @ 2.6 SPACES / 1000 SF GFA = 416
- BUILDING H ..... @ 3.0 SPACES / 1000 SF GFA = 258
- BUILDING I ..... @ 3.0 SPACES / 1000 SF GFA = 258
- BUILDING J ..... @ 3.0 SPACES / 1000 SF GFA = 258

PARKING SPACES PROPOSED 2650

- PARKING GARAGE A 1500
  9 LEVELS ABOVE GRADE
  2 LEVELS BELOW GRADE = TOTAL 11 LEVELS
- PARKING GARAGE B 1150
  6 LEVELS

OPEN SPACE REQUIRED ..... 2.20 AC
(15% OF NET LAND AREA)

OPEN SPACE PROPOSED ..... 6.77 AC
(46% OF NET LAND AREA)

* PLUS SPACES FOR USES IN CELLAR. SEE NOTE 24.

TABULATION FOR AREA OF PARTIAL GDPA OPTION 3

EXISTING/PROPOSED ZONING C-3
LAND AREA OF PARTIAL GDPA ..... 16.14 AC

PROPOSED USE ..... OFFICE/EDUCATIONAL/PUBLIC

PROPOSED GROSS FLOOR AREA (GFA) ..... 487,804+SF

- BUILDING F ..... 69,804± SF
- BUILDING G ..... 160,000± SF
- BUILDING H & I ..... 129,000± SF
- BUILDING J ..... 129,000± SF

PROPOSED FLOOR AREA RATIO (FAR) 0.69

MAXIMUM HEIGHT OF BUILDINGS

- BUILDING F ..... 4 STORIES ..... 60 FT
- BUILDING G ..... 4 STORIES ..... 60 FT
- BUILDING H & I ..... 5 STORIES ..... 90 FT
- BUILDING J ..... 6 STORIES ..... 90 FT

PARKING SPACES REQUIRED 1298*

- BUILDING F ..... @ 3.0 SPACES / 1000 SF GFA = 210
- BUILDING G ..... @ 2.6 SPACES / 1000 SF GFA = 416
- BUILDING H & I @ 2.6 SPACES / 1000 SF GFA = 336
- BUILDING J ..... @ 2.6 SPACES / 1000 SF GFA = 336

PARKING SPACES PROPOSED 2650

- PARKING GARAGE A 1500
  9 LEVELS ABOVE GRADE
  2 LEVELS BELOW GRADE = TOTAL 11 LEVELS
- PARKING GARAGE B 1150
  6 LEVELS

OPEN SPACE REQUIRED ..... 2.20 AC
(15% OF NET LAND AREA)

OPEN SPACE PROPOSED ..... 6.78 AC
(46% OF NET LAND AREA)

* PLUS SPACES FOR USES IN CELLAR. SEE NOTE 24.

TABULATION FOR AREA OF PARTIAL GDPA OPTION 4

EXISTING/PROPOSED ZONING C-3
LAND AREA OF PARTIAL GDPA ..... 16.14 AC

PROPOSED USE ..... OFFICE/EDUCATIONAL/PUBLIC

PROPOSED GROSS FLOOR AREA (GFA) ..... 487,804+SF

- BUILDING F ..... 69,804± SF
- BUILDING G ..... 160,000± SF
- BUILDING H ..... 86,000± SF
- BUILDING I ..... 86,000± SF
- BUILDING J ..... 86,000± SF

PROPOSED FLOOR AREA RATIO (FAR) 0.69

MAXIMUM HEIGHT OF BUILDINGS

- BUILDING F ..... 4 STORIES ..... 60 FT
- BUILDING G ..... 4 STORIES ..... 60 FT
- BUILDING H ..... 6 STORIES ..... 90 FT
- BUILDING I ..... 6 STORIES ..... 90 FT
- BUILDING J ..... 6 STORIES ..... 90 FT

PARKING SPACES REQUIRED 1400*

- BUILDING F ..... @ 3.0 SPACES / 1000 SF GFA = 210
- BUILDING G ..... @ 2.6 SPACES / 1000 SF GFA = 416
- BUILDING H ..... @ 3.0 SPACES / 1000 SF GFA = 258
- BUILDING I ..... @ 3.0 SPACES / 1000 SF GFA = 258
- BUILDING J ..... @ 3.0 SPACES / 1000 SF GFA = 258

PARKING SPACES PROPOSED 2650

- PARKING GARAGE A (OPTION 2) 1500
  9 LEVELS ABOVE GRADE
  2 LEVELS BELOW GRADE = TOTAL 11 LEVELS
- PARKING GARAGE B 1150
  6 LEVELS ABOVE GRADE
  2 LEVELS BELOW GRADE = TOTAL 8 LEVELS

OPEN SPACE REQUIRED ..... 2.20 AC
(15% OF NET LAND AREA)

OPEN SPACE PROPOSED ..... 7.34 AC
(50% OF NET LAND AREA)

* PLUS SPACES FOR USES IN CELLAR. SEE NOTE 24.

AS APPROVED BY THE BOARD OF SUPERVISORS ON JULY 13, 2009

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RZ87-P-038-05 WOD

Application No. Staff

APPROVED DEVELOPMENT PLAN
(DP) (GDP) (CDP) (FDP)
SEE PROFFERS DATED 6/30/11
Date of (BOS) (PC) approval 7/26/11
Sheet 4 of 24

INOVA WILLOW OAKS

PARTIAL GENERALIZED DEVELOPMENT PLAN AMENDMENT

PROVIDENCE DISTRICT
FAIRFAX COUNTY, VIRGINIA

SEAL

COMMONWEALTH OF VIRGINIA
TIMOTHY CHARLES CULLETON
Lic. No. 20112
6.10.09
PROFESSIONAL ENGINEER

KEY PLAN

COMMONWEALTH OF VIRGINIA
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PROFESSIONAL ENGINEER

SCALE

0' 50' 100'

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6	03.26.09	ARW	
5	02.19.09	ARW	
4	01.23.09	ARW	
3	10.09.08	ARW	
2	08.28.08	ARW	
1	07.31.08	ARW	

REVISIONS

DRAWN BY JMC
APPROVED BY
CHECKED BY PGY
DATE April 14, 2008

TITLE

Inova
Willow Oaks

Partial Generalized Development Plan Amendment
Optional Layouts

PROJECT NO.

4

SHEET NO. 4 OF 20

M-10690

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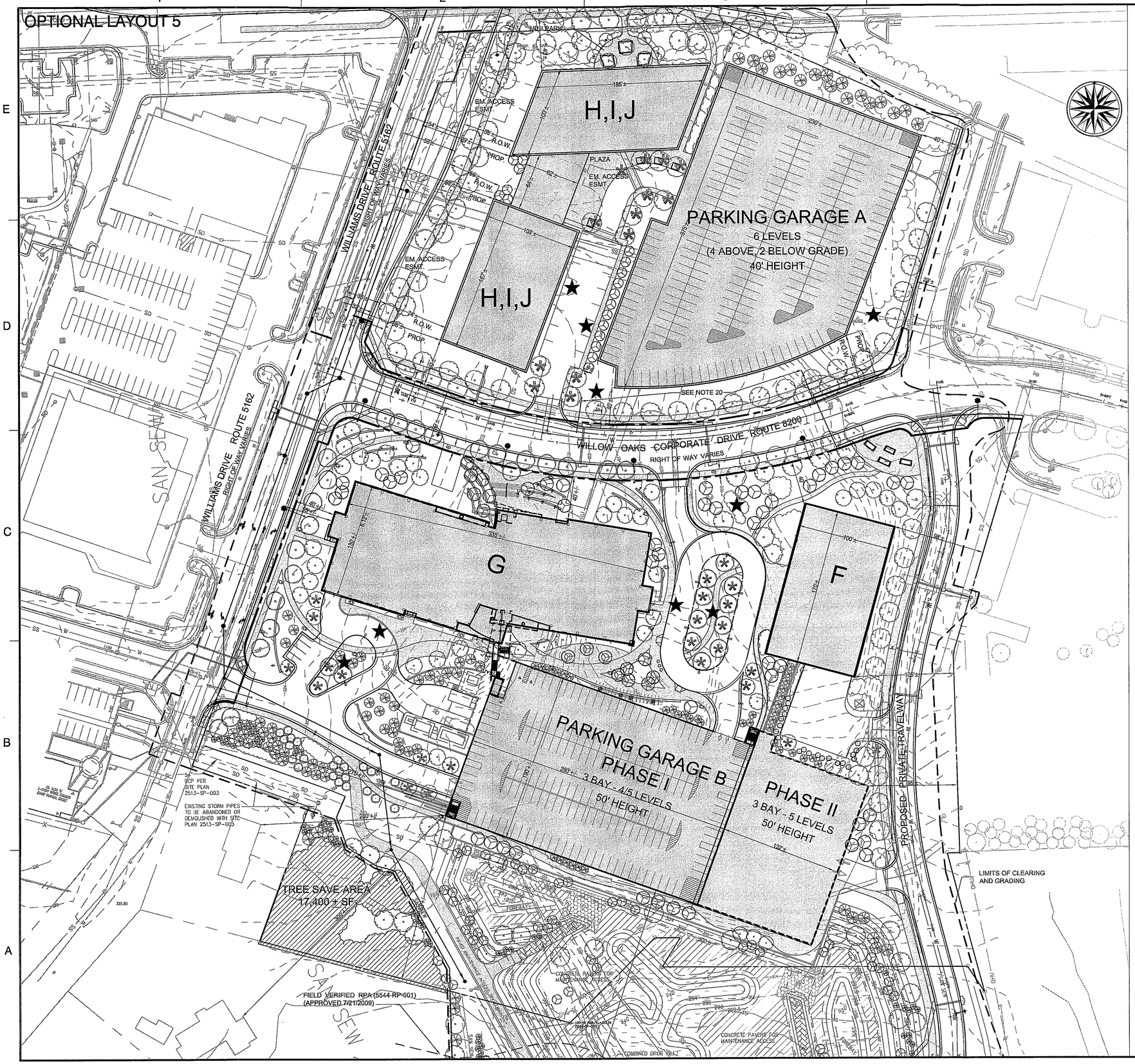
OPTIONAL LAYOUT 5



Legend

- PROPOSED LARGE DECIDUOUS TREE (Category III and IV Deciduous trees)
- PROPOSED EVERGREEN TREE (Category III and IV Evergreen trees)
- PROPOSED EVERGREEN TREE (Category I and II Evergreen trees)
- PROPOSED ORNAMENTAL TREE (Category I and II Deciduous trees)
- PROPOSED SHRUB MASS / PERENNIALS / GROUNDCOVER
- APPROXIMATE LIMITS OF CLEARING AND GRADING
- POSSIBLE L.I.D. LOCATION
- PROPOSED 6' FENCE
- PROPOSED RIPARIAN REVEGETATION AREA

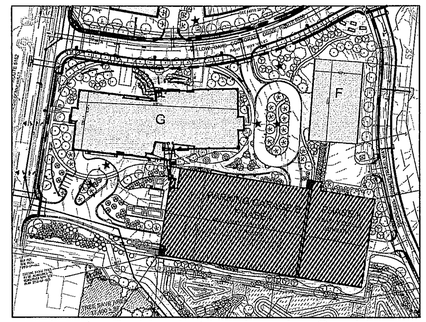
NOTES:

1. IN ADDITION TO THE INFORMATION PROVIDED IN NOTE 1 ON SHEET 3, IT IS HEREBY NOTED THAT A FOURTH PCA TO RZ 87-P-038 WAS APPROVED ON JULY 13, 2009. THE PURPOSE OF THIS FIFTH PCA IS TO PROVIDE FOR AN ADDITIONAL "OPTIONAL LAYOUT 5" AS SHOWN ON NEW SHEETS 4A AND 4B. ACCORDINGLY, NOTWITHSTANDING PAR. 6 OF NOTE 2 ON SHEET 3, THERE ARE NOW THREE (3) OPTIONAL DEVELOPMENT PROGRAMS PROPOSED FOR THE SOUTHERN LANDBAY. FURTHER, NOTWITHSTANDING THAT THE GDPA CALLS OUT "CONCRETE PAVERS" FOR THE POND MAINTENANCE ACCESS AREAS ON SHEETS 8 AND 10-14, THE GDPA IS HEREBY AMENDED TO ALLOW GRASS CRETE TO BE PROVIDED IN SUCH AREAS INSTEAD OF CONCRETE PAVERS. NO OTHER CHANGES TO THE GDPA APPROVED PURSUANT TO PCA-4 ARE PROPOSED.
2. AT TIME OF FINAL SITE PLAN ADJUSTMENTS TO THE PLANTINGS AS SHOWN SHALL BE MADE TO ENSURE THE MINIMUM WIDTH OF ANY PLANTING AREA IS 8' AND TREES ARE NOT PLANTED CLOSER THAN 4' TO ANY RESTRICTIVE BARRIER, UNLESS AN ACCEPTABLE ALTERNATE PLANTING PRACTICE IN CONFORMANCE WITH THE PFM IS USED. MINIMUM PLANTING AREAS SHALL BE PROVIDED IN ACCORDANCE WITH PFM SECTIONS 12-0510.4E(5) AND 12-0601.1B FOR ALL PLANTINGS ASSOCIATED WITH OPTIONAL LAYOUT 5, UNLESS AN ACCEPTABLE ALTERNATE PLANTING PRACTICE IN CONFORMANCE WITH THE PFM IS USED.
3. THE EMERGENCY ACCESS EASEMENTS SHOWN FOR BUILDINGS H, I & J ARE ALSO THE SAME FOR THE BASE BUILDING OPTION AS SHOWN ON SHEET 2 AS THE LAYOUT FOR H, I, J IS THE SAME.

Parking Lot Landscaping Tabulation - South of Willow Oaks Corporate Dr

PARKING LOT AREA .....78,260 SF±
PARKING LOT LANDSCAPING REQUIRED (5%) .....3,913 SF±
PARKING LOT LANDSCAPING PROPOSED (5.2%) .....4,200 SF±
(24 PROPOSED TREES @ AVG. 175 SF EA)

TREE COUNTED TOWARD PARKING LOT LANDSCAPING REQUIREMENT



Interior Parking Lot Landscaping Graphic
Not to Scale

Area Counted Towards Interior Parking Lot

* Interior parking lot landscaping north of Willow Oaks Corporate Drive (Buildings H, I, J and Parking Garage A) is unchanged from the base option, see sheet 2 for calculations

TABULATION FOR AREA OF PARTIAL GDPA OPTION 5

EXISTING/PROPOSED ZONING C-3
LAND AREA OF PARTIAL GDPA ..... 16.14 AC

PROPOSED USE ..... OFFICE/EDUCATIONAL/PUBLIC

PROPOSED GROSS FLOOR AREA (GFA) ..... 497,804±SF

BUILDING F ..... 69,804± SF
BUILDING G ..... 160,000± SF
BUILDING H, I, J ..... 258,000± SF

PROPOSED FLOOR AREA RATIO (FAR) 0.69

MAXIMUM HEIGHT OF BUILDINGS

BUILDING F ..... 4 STORIES ..... 60 FT
BUILDING G ..... 4 STORIES ..... 60 FT
BUILDING H, I, J ..... 6 STORIES ..... 90 FT

PARKING SPACES REQUIRED 1297*

BUILDING F ..... @ 3.0 SPACES / 1000 SF GFA = 210
BUILDING G ..... @ 2.5 SPACES / 1000 SF GFA = 416
BUILDING H, I, J ..... @ 2.6 SPACES / 1000 SF GFA = 671

PARKING SPACES PROPOSED 2650

PARKING GARAGE A 1600

PARKING GARAGE B 1150
4/6 LEVELS

OPEN SPACE REQUIRED ..... 2.20 AC
(10% OF NET LAND AREA)

OPEN SPACE PROPOSED ..... 6.42 AC
(43% OF NET LAND AREA)

* PLUS SPACES FOR USES IN CELLAR. SEE NOTE 24.

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VIKA

Application No. PCA 87-P-038-5 Staff WO'D
APPROVED DEVELOPMENT PLAN
(DP) (GDP) (CDP) (FDP)
SEE PROFFERS DATED 6/20/11
Date of (BOS) (PC) approval 7/26/11
Sheet 5 of 24

INOVA
WILLOW OAKS
PARTIAL GENERALIZED DEVELOPMENT PLAN AMENDMENT
PROVIDENCE DISTRICT
FAIRFAX COUNTY, VIRGINIA

SEAL

COMMONWEALTH OF VIRGINIA
EDMUND J. IGNACIO
Lic. No. 33579
4/27/11
PROFESSIONAL ENGINEER

KEY PLAN

SCALE
0' 50' 100'

No.	DATE	BY	Description
12	04.27.11		
11	03.04.11		

REVISIONS

DRAWN BY
APPROVED BY
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DATE

TITLE
Inova
Willow Oaks
Partial Generalized Development Plan Amendment
Optional Layouts

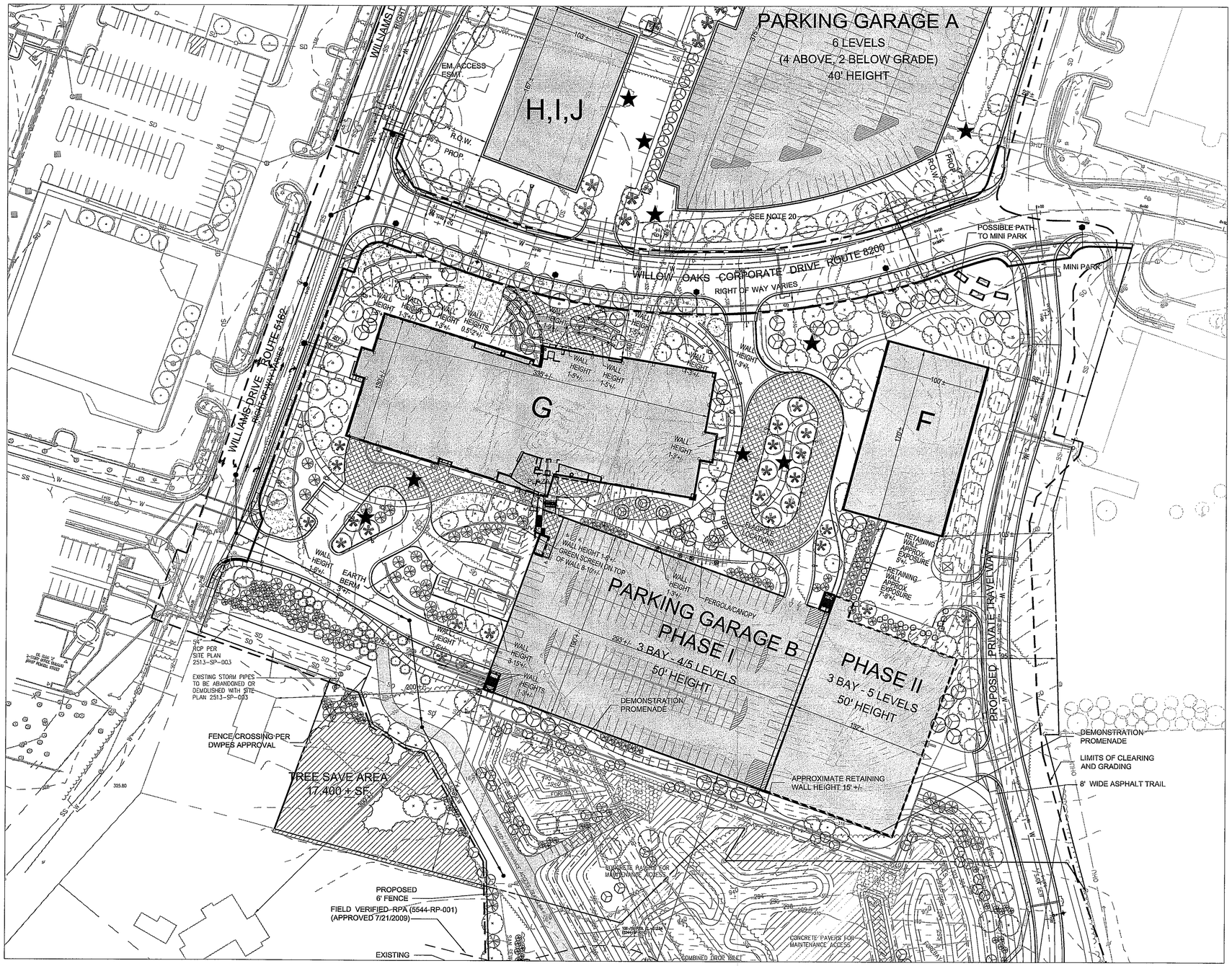
PROJECT NO.

4A

SHEET NO. 4A OF 20

M-10690

OPTIONAL LAYOUT 5



Legend

- PROPOSED LARGE DECIDUOUS TREE (Category III and IV Deciduous trees)
- PROPOSED EVERGREEN TREE (Category III and IV Evergreen trees)
- PROPOSED EVERGREEN TREE (Category I and II Evergreen trees)
- PROPOSED ORNAMENTAL TREE (Category I and II Deciduous trees)
- PROPOSED SHRUB MASS / PERENNIALS / GROUNDCOVER
- PROPOSED SITE FURNITURE
- PROPOSED LAWN/SOD
- PROPOSED SPECIAL PAVING

NOTE:
THE DETAILS PROVIDED HEREON REPRESENT THE PROPOSED HARDSCAPE AND LANDSCAPE PLANS FOR THE INDIVIDUAL OPEN SPACE AREAS. MINOR DESIGN CHANGES MAY BE MADE WITH FINAL DESIGN AND ENGINEERING.

RA 87-P-038-5
Application No. _____ Staff LDO'D
APPROVED DEVELOPMENT PLAN
(DP) (GDP) (CDP) (FDP)
SEE PROFFERS DATED 6/20/11
Date of (BOS) (PC) approval 7/26/11
Sheet 6 of 24

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PARTIAL GENERALIZED DEVELOPMENT PLAN AMENDMENT
PROVIDENCE DISTRICT
FAIRFAX COUNTY, VIRGINIA

SEAL
COMMONWEALTH OF VIRGINIA
EDMUND J. IGNACIO
Lic. No. 33579
4/27/11
PROFESSIONAL ENGINEER

KEY PLAN

SCALE
0' 50' 100'

No.	DATE	BY	Description
12	04.27.11		
11	03.04.11		

REVISIONS

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APPROVED BY
CHECKED BY
DATE

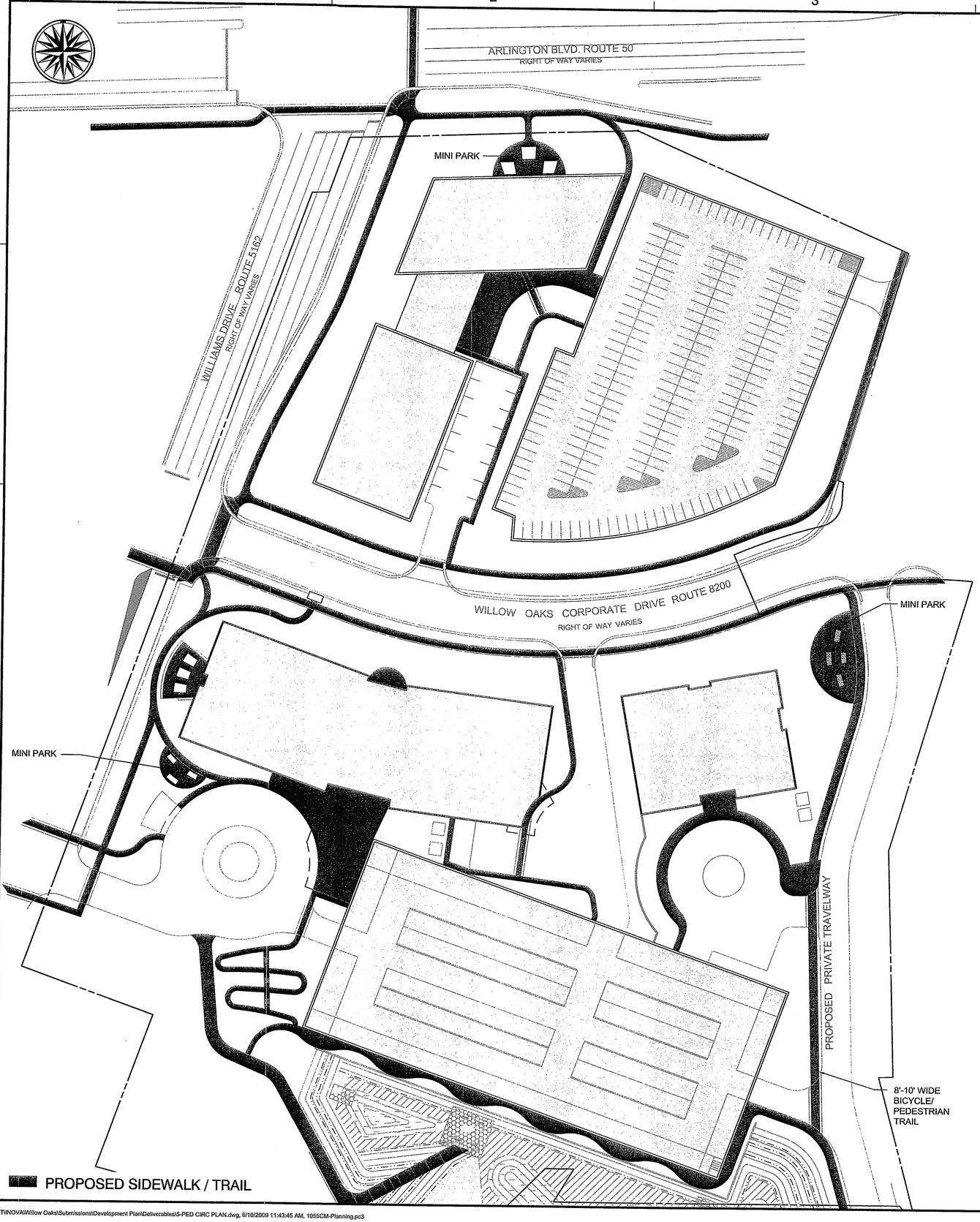
TITLE
Inova
Willow Oaks
Partial Generalized Development Plan Amendment
Detail Enlargements

PROJECT NO.

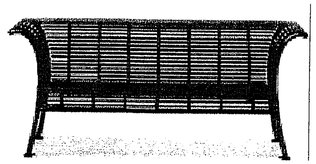
4B

SHEET NO. 4B OF 20

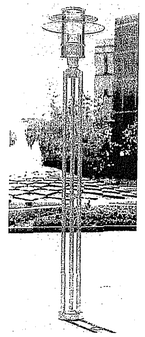
M-10690



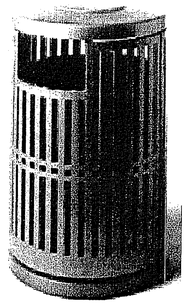
NOTE: The typical site furniture presented on this sheet are shown to illustrate the general theme and character of the proposed development. They are subject to minor modification with final engineering and architectural design.



TYPICAL BENCH



TYPICAL
DECORATIVE LIGHT



TYPICAL
TRASH RECEPTACLE

PCA 87-P-038-5
Application No. _____ Staff WOID
APPROVED DEVELOPMENT PLAN
(DP) (GDP) (CDP) (FDP)
SEE PROFFERS DATED 6/30/11
Date of (BOS) (PC) approval 7/24/11
Sheet 7 of 24

AS APPROVED BY THE BOARD OF SUPERVISORS ON JULY 13, 2009

Q:\PROJECT\INOVA\Willow Oaks\Submissions\Development Plan\Deliverables\5-PED CIRC PLAN.dwg, 6/10/2009 11:43:45 AM, 1055CM-Planning.pc3

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INOVA
WILLOW OAKS

PARTIAL GENERALIZED
DEVELOPMENT PLAN AMENDMENT
PROVIDENCE DISTRICT
FAIRFAX COUNTY, VIRGINIA

SEAL

COMMONWEALTH OF VIRGINIA
TIMOTHY CHARLES CULLETON
Lic. No. 20112
6.10.09
PROFESSIONAL ENGINEER

KEY PLAN

COMMONWEALTH OF VIRGINIA
EDMUND J. IGNACIO
Lic. No. 33579
4/27/11
PROFESSIONAL ENGINEER

SCALE
0' 50' 100'

No.	DATE	BY	Description
10	06.10.09	ARW	
9	06.05.09	ARW	
8	05.20.09	ARW	
7	04.20.09	ARW	
6	03.26.09	ARW	
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4	01.23.09	ARW	
3	10.09.08	ARW	
2	08.28.08	ARW	
1	07.31.08	ARW	

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DRAWN BY JMC
APPROVED BY
CHECKED BY PGY
DATE April 14, 2008

TITLE

Inova
Willow Oaks

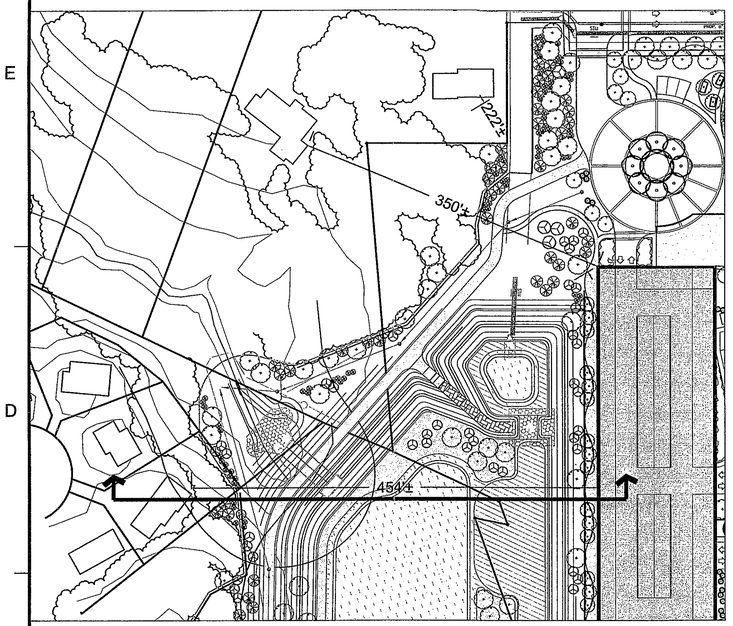
Partial Generalized Development
Pedestrian Circulation Plan /
Site Furniture Details

PROJECT NO.

5

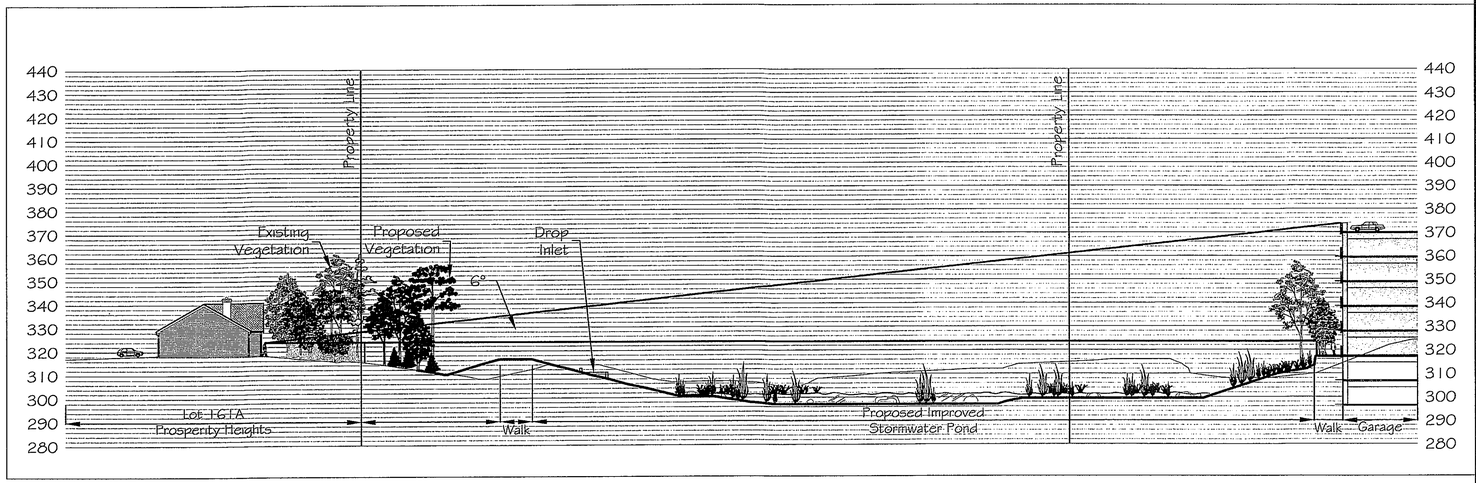
SHEET NO. 5 OF 20

M-10690

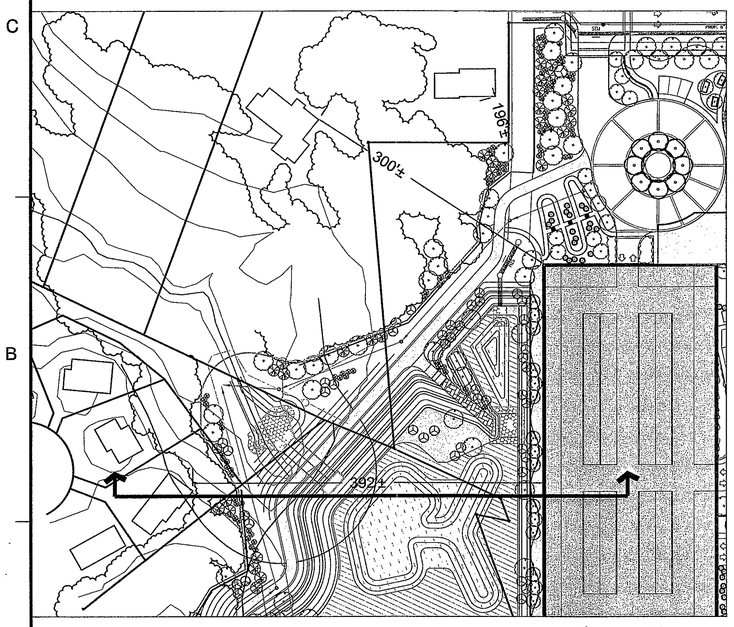


SECTION A-A'

0' 80' 160'



A 2 BAY GARAGE A'



SECTION B-B'

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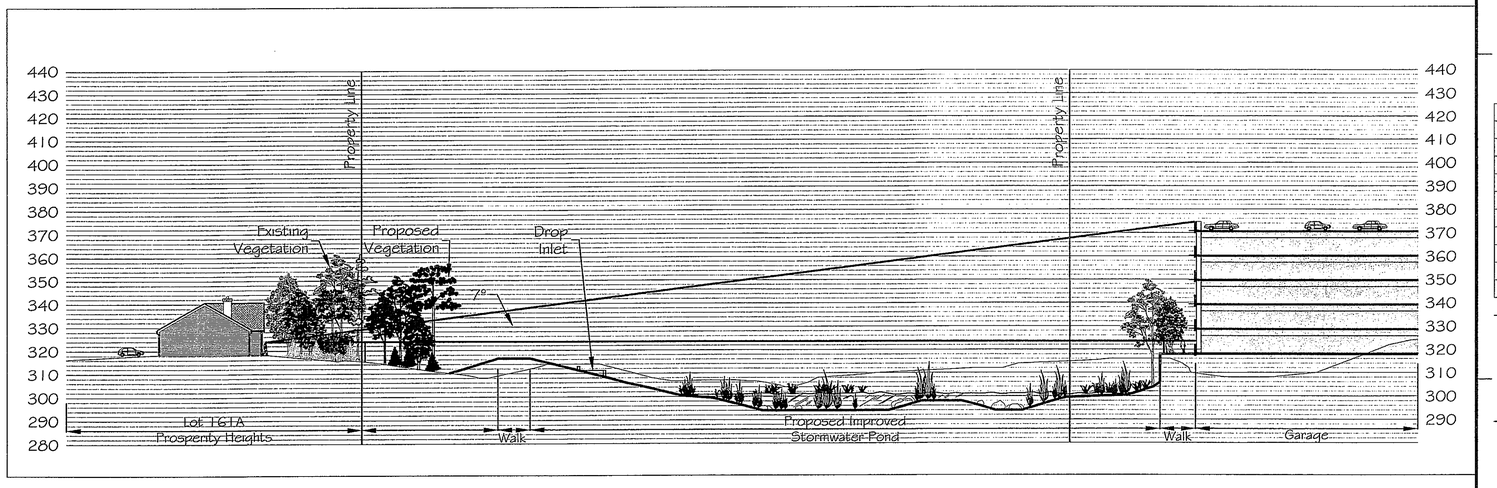

B 3 BAY GARAGE B'

Application No. RZA 87-P-038-5 Staff WDM
APPROVED DEVELOPMENT PLAN
(DP) (GDP) (CDP) (FDP)
SEE PROFFERS DATED 6/29/11
Date of (BOS) (PC) approval 7/24/11
Sheet 8 of 24

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PARTIAL GENERALIZED DEVELOPMENT PLAN AMENDMENT

PROVIDENCE DISTRICT
FAIRFAX COUNTY, VIRGINIA

SEAL

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PROFESSIONAL ENGINEER

KEY PLAN

COMMONWEALTH OF VIRGINIA
EDMUND J. IGNACIO
Lic. No. 33579
4/27/11
PROFESSIONAL ENGINEER

SCALE

0' 30' 60'

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8	05.20.09	ARW	
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2	08.28.08	ARW	
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CHECKED BY PGY
DATE April 14, 2008

TITLE

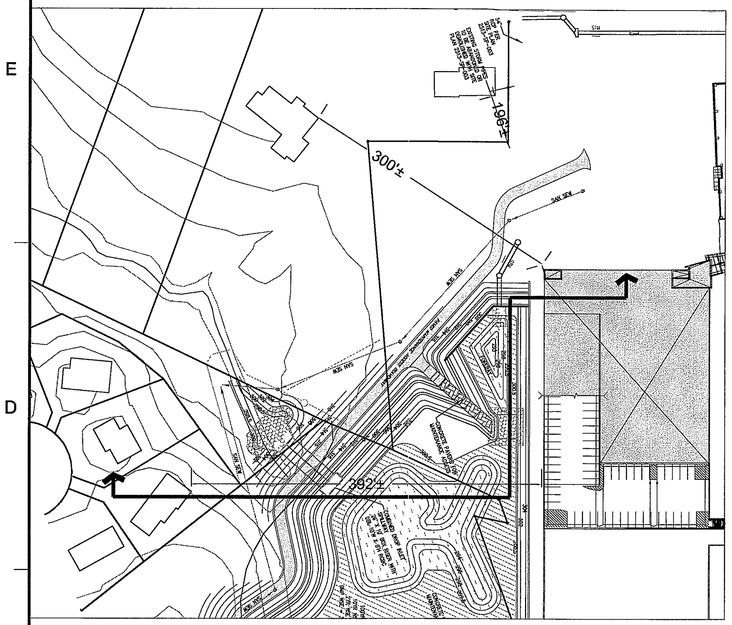
Inova
Willow Oaks

Partial Generalized Development Plan Amendment
Cross Sections

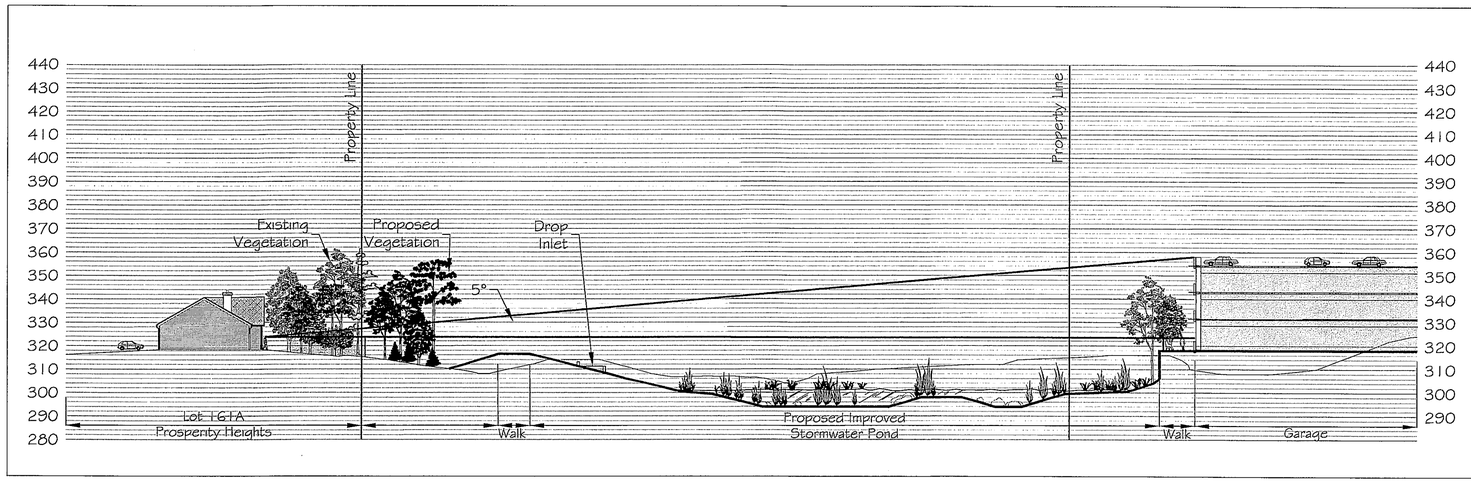
PROJECT NO.

6

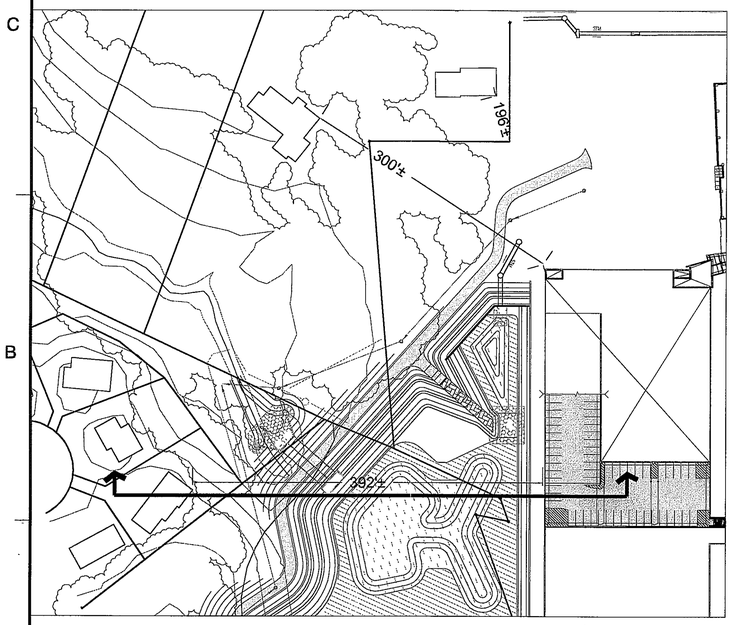
SHEET NO. 6 OF 20



SECTION A-A'



A 4 TIER GARAGE A'



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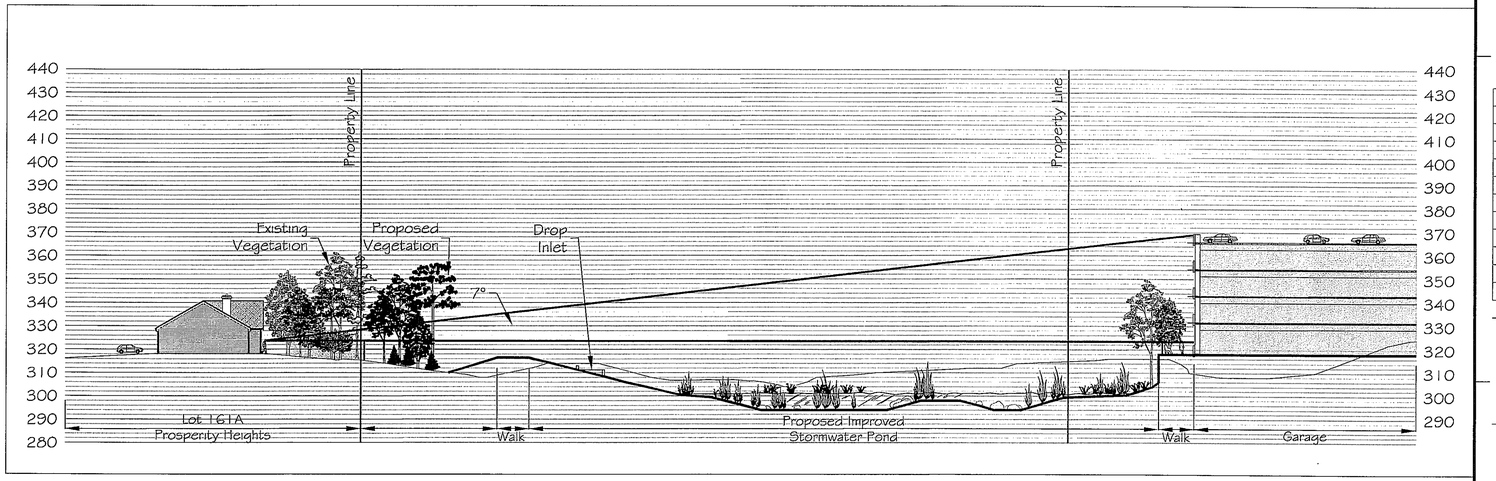

B 5 TIER GARAGE B'

Application No. PLA87-P-038-5 Staff WO'D
APPROVED DEVELOPMENT PLAN
(DP) (GDP) (CDP) (FDP)
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Date of (BOS) (PC) approval 7/26/11
Sheet 9 of 24

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PARTIAL GENERALIZED
DEVELOPMENT PLAN AMENDMENT
PROVIDENCE DISTRICT
FAIRFAX COUNTY, VIRGINIA

SEAL

COMMONWEALTH OF VIRGINIA
EDMUND J. IGNACIO
Lic. No. 33579
4/27/11
PROFESSIONAL ENGINEER

KEY PLAN

SCALE

0' 30' 60'

No.	DATE	BY	Description
11	03.04.11		
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2	08.28.08	ARW	
1	07.31.08	ARW	

REVISIONS

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DATE April 14, 2008

TITLE

Inova
Willow Oaks

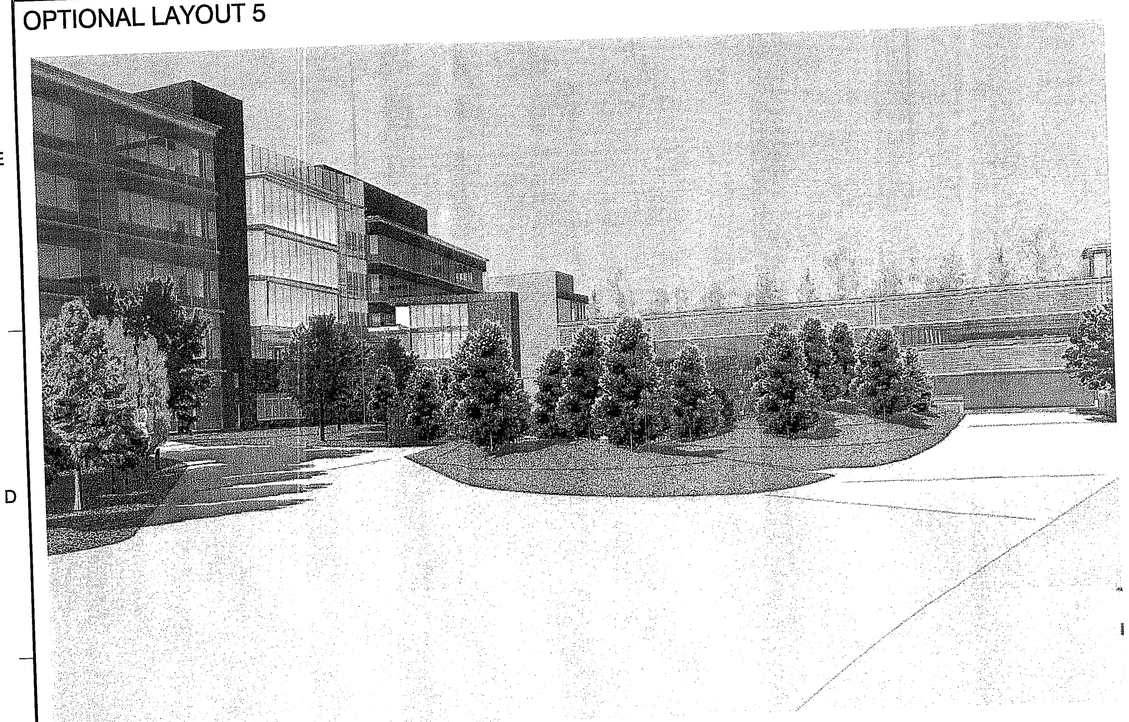
Partial Generalized Development
Plan Amendment
Cross Sections Option 5

PROJECT NO.

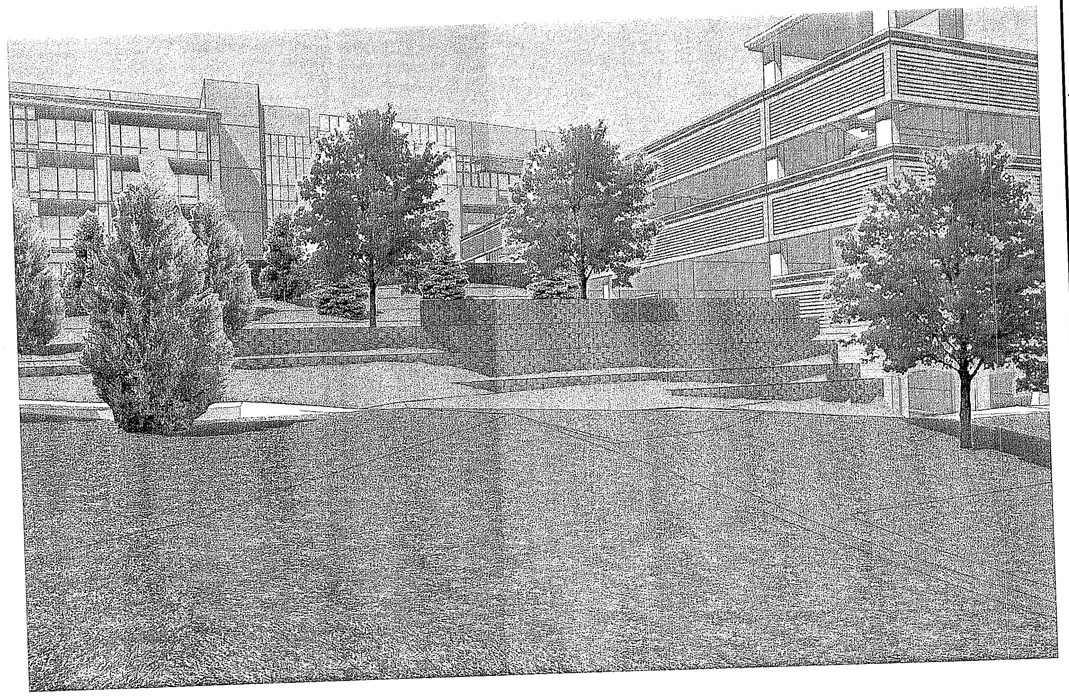
6A

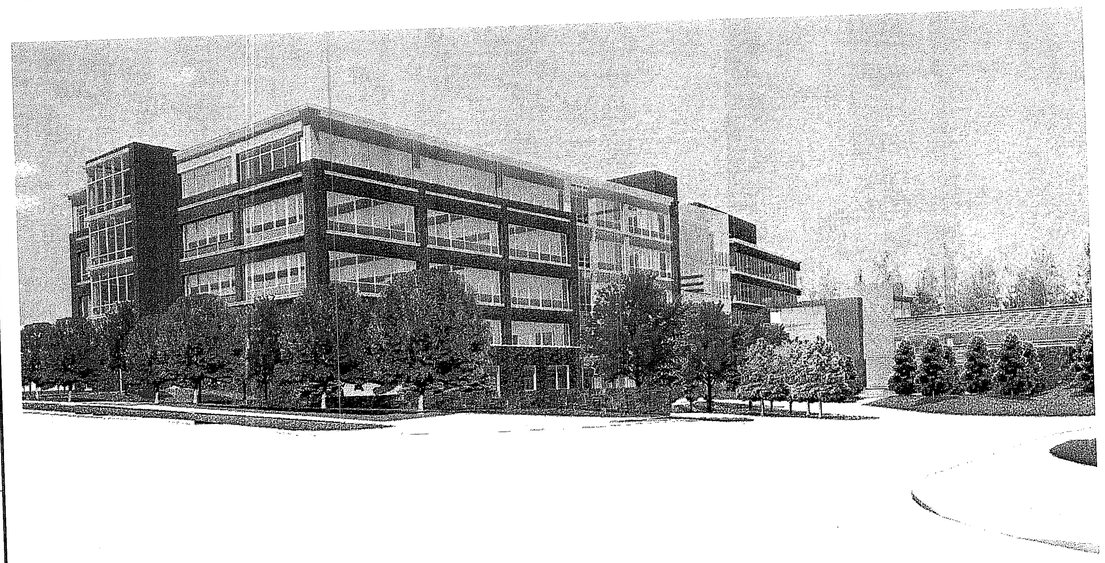
SHEET NO. 6A OF 20

OPTIONAL LAYOUT 5



WOODBURN HUMAN SERVICES BUILDING
8221 WILLOW OAKS DRIVE, MERRIFIELD, VIRGINIA
NORITAKE associates





WOODBURN HUMAN SERVICES BUILDING
8221 WILLOW OAKS DRIVE, MERRIFIELD, VIRGINIA
NORITAKE associates

NOTE:
THESE 3D DETAIL ENLARGEMENTS ARE FOR OPTIONAL LAYOUT 5 AND ARE A VIEW FROM THE SOUTHWEST TOWARDS BUILDING G AND PARKING GARAGE B.

Application No. PCA 87-P-038-5 Staff WO'D
APPROVED DEVELOPMENT PLAN
(DP) (GDP) (CDP) (FDP)
SEE PROFFERS DATED 6/20/11
Date of (BOS) (PC) approval 7/26/11
Sheet 10 of 24

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PROVIDENCE DISTRICT
FAIRFAX COUNTY, VIRGINIA

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EDMUND J. IGNACIO
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4/27/11
PROFESSIONAL ENGINEER

KEY PLAN

SCALE

No.	DATE	BY	Description
12	04.27.11		

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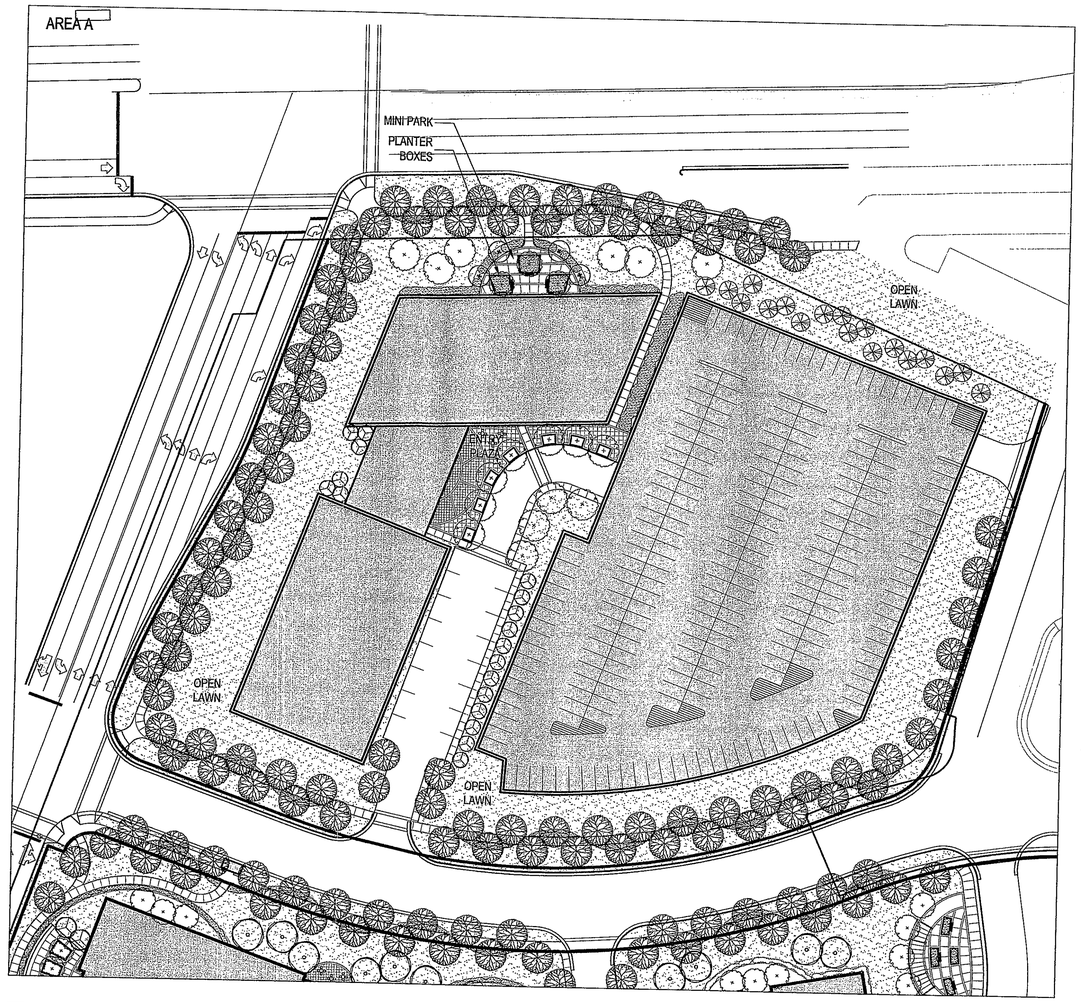
TITLE
Inova
Willow Oaks
Partial Generalized Development Plan Amendment
3D Detail Enlargements Option 5

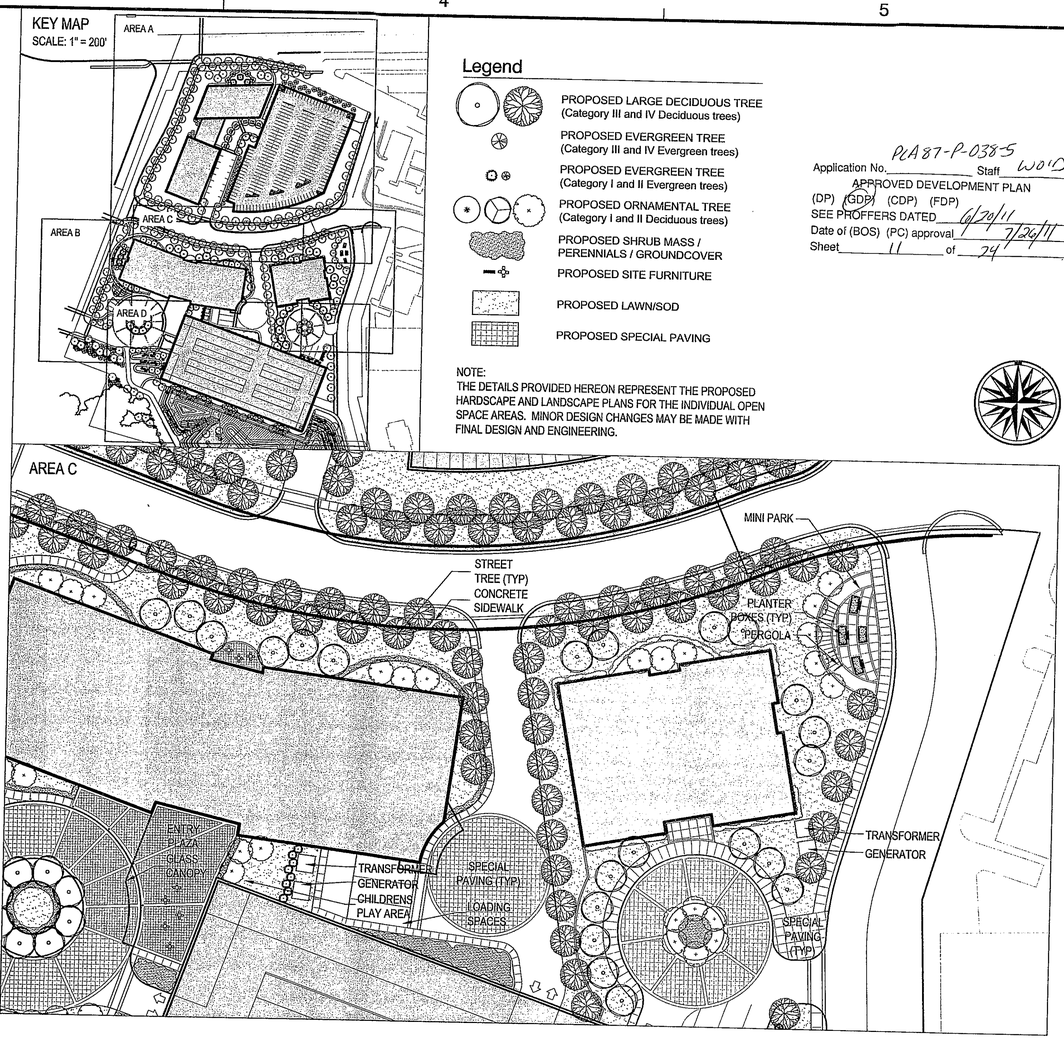
PROJECT NO.

6B

SHEET NO. 6B OF 20

M-10690





Legend

- PROPOSED LARGE DECIDUOUS TREE (Category III and IV Deciduous trees)
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- PROPOSED EVERGREEN TREE (Category I and II Evergreen trees)
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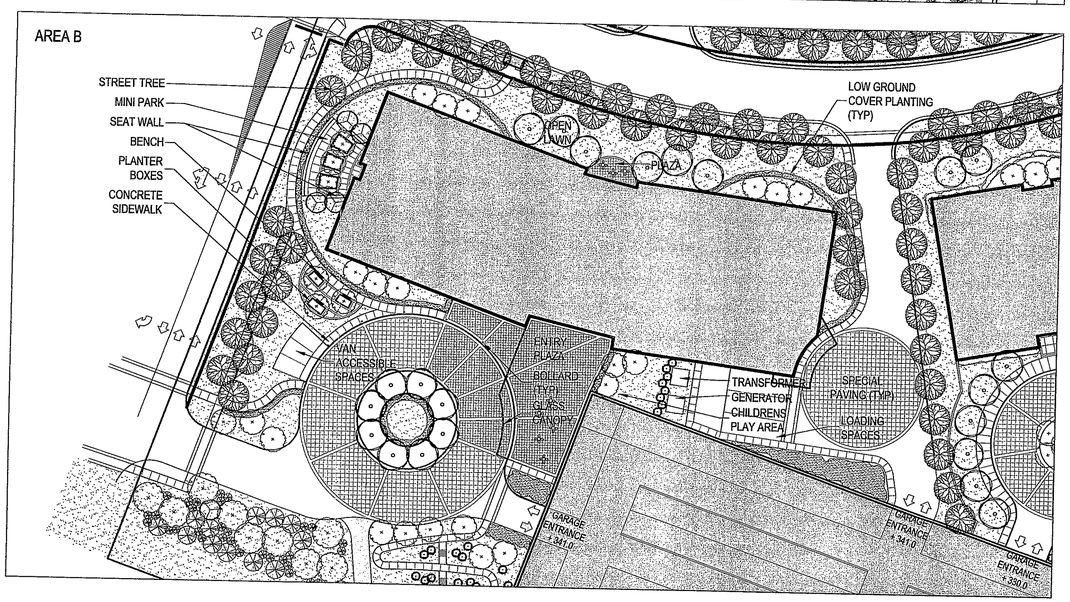
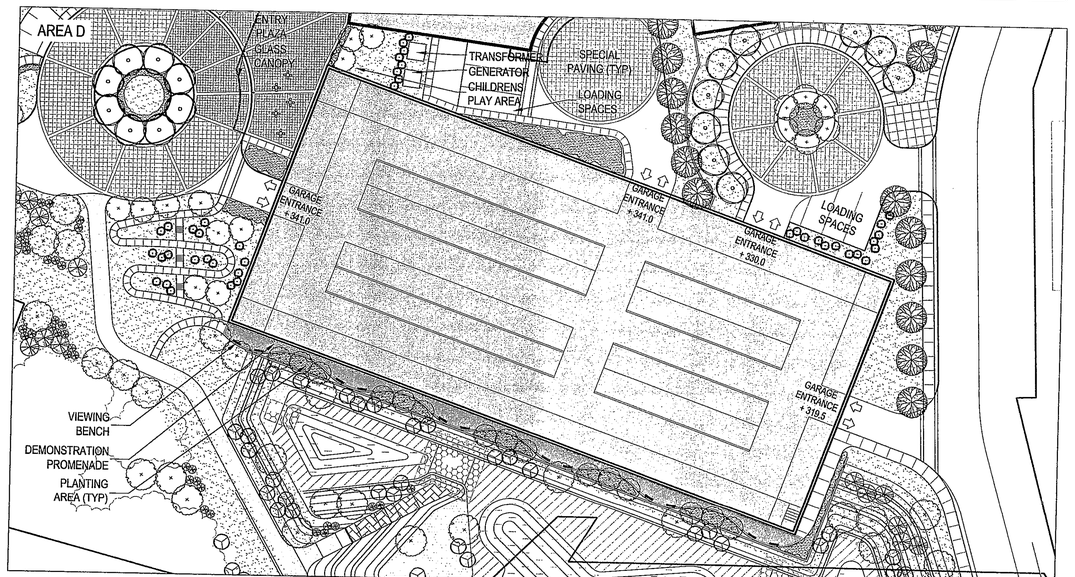
Application No. PCA 87-P-038-5 Staff WOID
APPROVED DEVELOPMENT PLAN
(DP) (GDP) (CDP) (FDP)
SEE PROFFERS DATED 6/20/11
Date of (BOS) (PC) approval / 7/26/11
Sheet 11 of 24





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PARTIAL GENERALIZED
DEVELOPMENT PLAN AMENDMENT

PROVIDENCE DISTRICT
FAIRFAX COUNTY, VIRGINIA

SEAL

COMMONWEALTH OF VIRGINIA
TIMOTHY CHARLES CULLETON
Lic. No. 20112
6.10.09
PROFESSIONAL ENGINEER

KEY PLAN

COMMONWEALTH OF VIRGINIA
EDMUND J. IGNACIO
Lic. No. 33579
4/22/11
PROFESSIONAL LANDSCAPE ARCHITECT

SCALE
0' 50' 100'

No.	DATE	BY	Description
10	06.10.09	ARW	
9	06.05.09	ARW	
8	05.20.09	ARW	
7	04.20.09	ARW	
6	03.26.09	ARW	
5	02.19.09	ARW	
4	01.23.09	ARW	
3	10.09.08	ARW	
2	08.28.08	ARW	
1	07.31.08	ARW	

REVISIONS

DRAWN BY JMC
APPROVED BY
CHECKED BY PGY
DATE April 14, 2008

TITLE

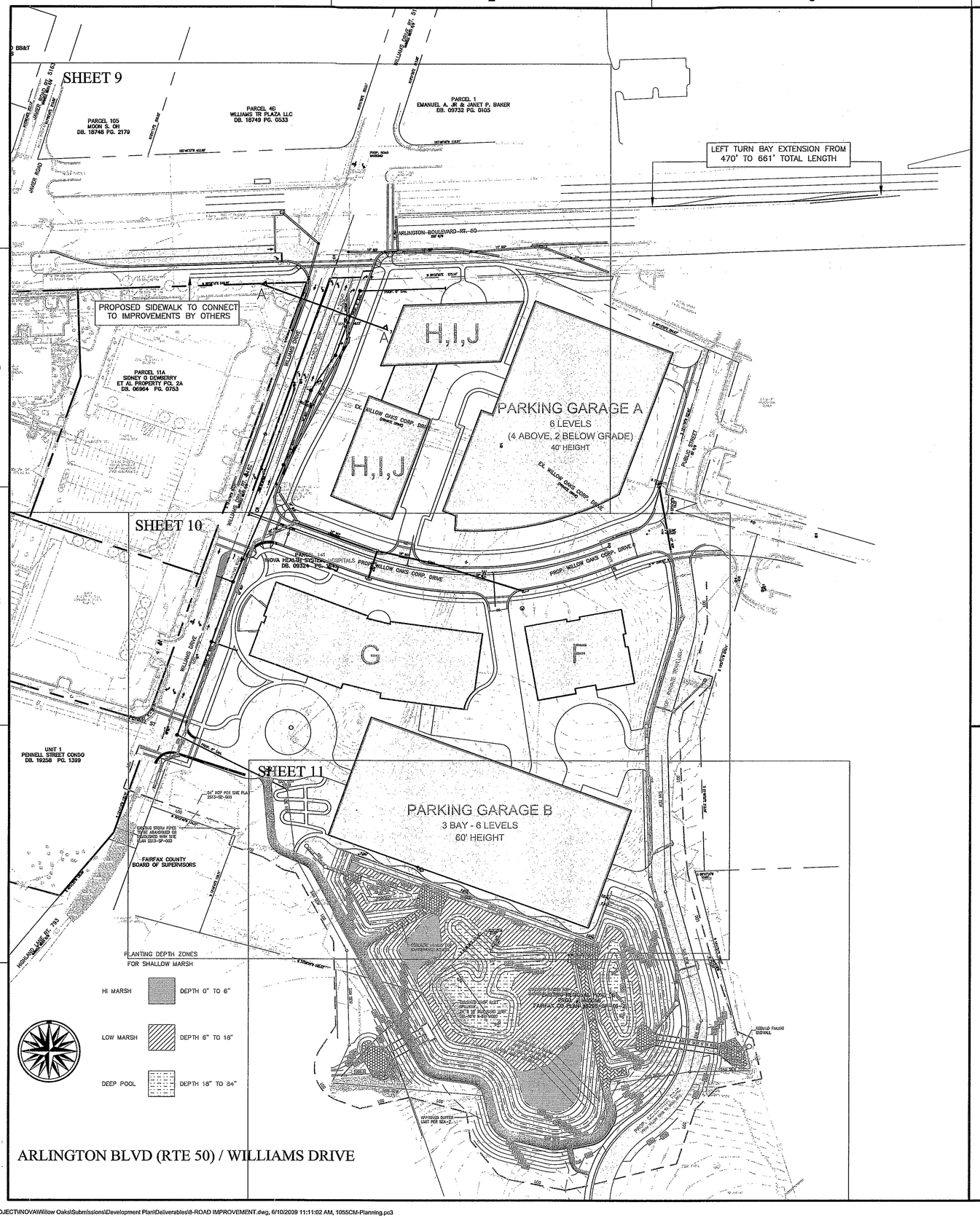
Inova
Willow Oaks
Partial Generalized Development Plan Amendment
Detail Enlargements

PROJECT NO.

7

SHEET NO. 7 OF 20

M-10690



GENERAL NOTES

SHEET 8

THIS SHEET PROVIDES AND OVERALL VIEW OF THE PROPOSED IMPROVEMENTS AND ALL GENERAL NOTES

AN EXTENDED LEFT TURN BAY ON ROUTE 50 TO SOUTHBOUND WILLIAMS DRIVE IS SHOWN WITH AN INCREASE IN TURNBAY LENGTH FROM 470' TO 661' WITH TAPER. BASED ON COUNTY MAPPED INFORMATION, THERE IS NO CONFLICT WITH THE EXISTING STRUCTURES IN THE MEDIAN.

SHEET 9

THE IMPROVEMENTS SHOWN ON THIS SHEET INCLUDE:

IMPROVEMENTS TO WILLIAMS DRIVE NORTHBOUND INCLUDE TWO SEPARATE NORTHBOUND LEFTS, A SINGLE THROUGH, AND TWO RIGHT TURN LANES, AS WELL AS TRAFFIC SIGNAL IMPROVEMENTS.

IMPROVEMENTS TO EASTBOUND ROUTE 50, AFTER JAVIER ROAD INTERSECTION, INCLUDE AN ADDITIONAL THROUGH LANE EXTENDING TO THE GALLOWS ROAD OFF RAMP, AND A RIGHT TURN LANE ONTO SOUTHBOUND WILLIAMS DRIVE.

THE EXISTING RT. 50 WESTBOUND LEFT TURN LANE ONTO SOUTHBOUND WILLIAMS WILL BE EXTENDED BY 200'. GRAPHIC SHOWN ON SHEET 8

SOUTHBOUND WILLIAMS DRIVE, NORTH OF ROUTE 50, WILL BE RESTRIPED TO HAVE A THROUGH–RIGHT TURN LANE, AND A LEFT TURN LANE.

SHEET 10

THE IMPROVEMENTS SHOWN ON THIS SHEET INCLUDE:

WILLIAMS DRIVE TO PENNELL STREET, PROVIDE AN ADDITIONAL SOUTHBOUND LANE, AND AN ADDITIONAL NORTHBOUND LANE TO WILLIAMS DRIVE, WHICH EXTENDS FROM THE ROUTE 50 INTERSECTION, TO ITS TERMINATION AT PENNELL STREET. THE EASTERN MOST NORTHBOUND LANE WILL SERVE AS A TURN LANE FOR PROPOSED WILLOW OAKS CORPORATE DRIVE.

SHEET 11

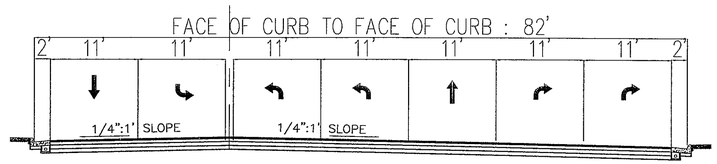
THE IMPROVEMENTS SHOWN ON THIS SHEET INCLUDE:

RELOCATE AND RESIZE THE REGIONAL POND TO PROVIDE STORMWATER MANAGEMENT FOR FUTURE DEVELOPMENT.

PROPOSED CONNECTOR ROAD TO TIE INTO EXISTING HOSPITAL FACILITY

NOTE:

SHEETS 8–11 WERE CREATED FOR VISUALIZING THE PROPOSED TRAFFIC IMPROVEMENTS SET FORTH IN THE PROFFERS. THE STORM SEWER SYSTEMS SHOWN WITH THE ROADWAY IMPROVEMENTS ARE APPROXIMATE AND ARE SUBJECT TO CHANGE UPON FINAL ENGINEERING. THE "EXISTING CONDITIONS" ARE SHOWN WITH TWO–FOOT CONTOURS AND WERE COMPILED THROUGH MULTIPLE SOURCES, INCLUDING FIELD SURVEYS, AIR FLOWN SURVEYS, COUNTY GIS, PROPOSED ROAD IMPROVEMENT PLANS BY OTHERS, AND DRAFTED LAYOUTS BASED ON AERIAL PHOTOGRAPHY. THESE DOCUMENTS ARE NOT FOR CONSTRUCTION PURPOSES



PROP. WILLIAMS DR. (NB)
TYPICAL SECTION A–A'

Application No. RZA87-P-035-5 Staff WDID
APPROVED DEVELOPMENT PLAN
(DP) (GDP) (CDP) (FDP)
SEE PROFFERS DATED 6/20/11
Date of (BOS) (PC) approval 7/26/11
Sheet 12 of 24

AS APPROVED BY THE BOARD OF SUPERVISORS ON JULY 13, 2009

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PARTIAL GENERALIZED
DEVELOPMENT PLAN AMENDMENT

PROVIDENCE DISTRICT
FAIRFAX COUNTY, VIRGINIA

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6·10·09
PROFESSIONAL ENGINEER

KEY PLAN

COMMONWEALTH OF VIRGINIA
EDMUND J. IGNACIO
Lic. No. 33579
4/27/11
PROFESSIONAL ENGINEER

SCALE
0' 80' 160'

No.	DATE	BY	Description
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3	10.09.08	ARW	
2	08.28.08	ARW	
1	07.31.08	ARW	

REVISIONS

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DATE April 14, 2008

TITLE

Inova
Willow Oaks

Partial Generalized Development Plan Amendment
Road Improvements Detail

PROJECT NO.

8

SHEET NO. 8 OF 20

M-10690

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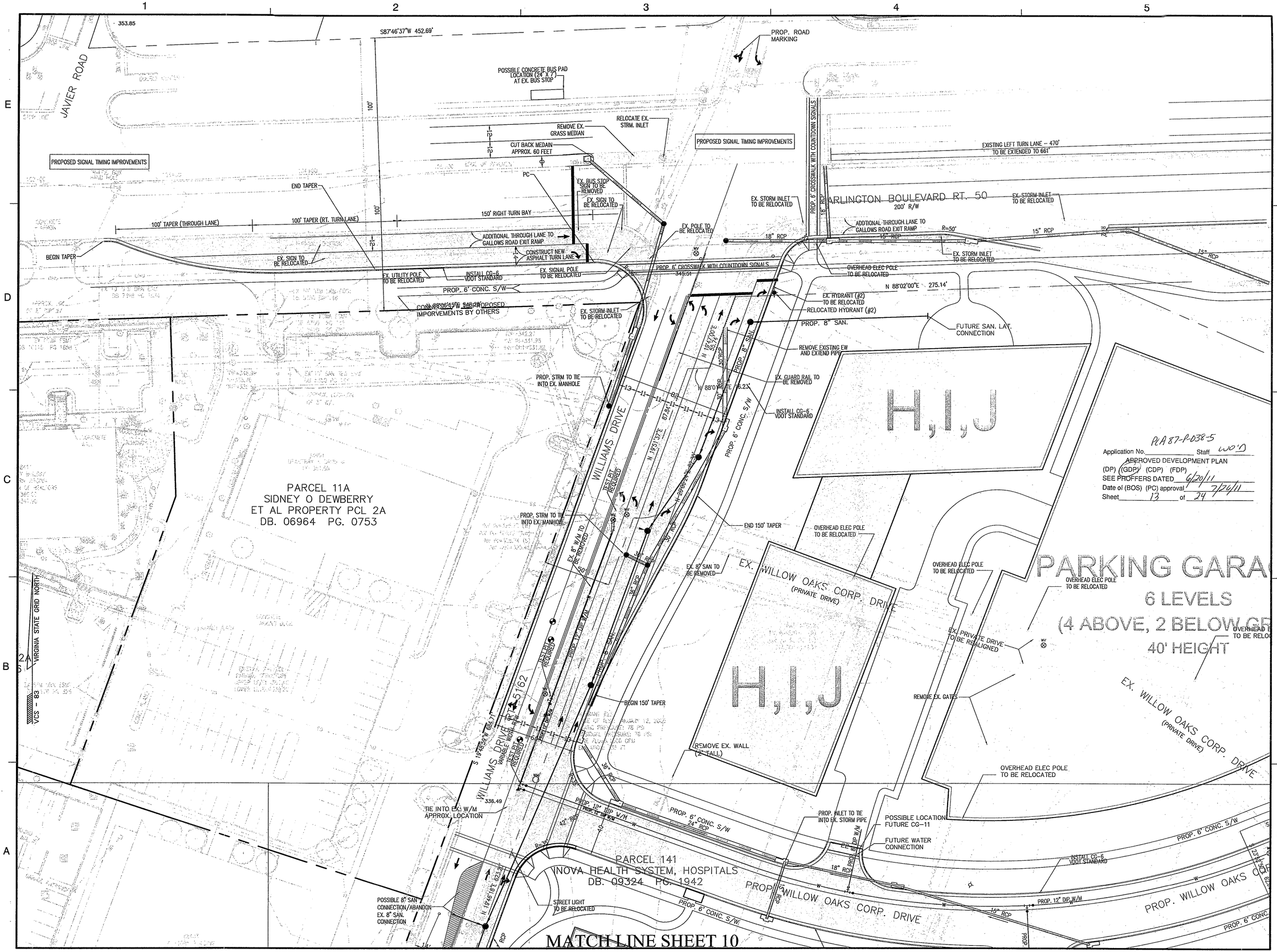

Application No. PA 87-P-038-5 Staff WO'D

APPROVED DEVELOPMENT PLAN

(DP) (GDP) (CDP) (FDP)

SEE PROFFERS DATED 6/20/11

Date of (BOS) (PC) approval 7/24/11

Sheet 13 of 24

Q:\PROJECT\INOVA\Willow Oaks\Submissions\Development Plan\Deliverables\9-ROAD IMPROVEMENT.dwg, 6/10/2009 11:06:50 AM, 1055CM-Planning.pc3

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INOVA
WILLOW OAKS

PARTIAL GENERALIZED DEVELOPMENT PLAN AMENDMENT

PROVIDENCE DISTRICT
FAIRFAX COUNTY, VIRGINIA

SEAL

COMMONWEALTH OF VIRGINIA
TIMOTHY CHARLES CULLEITON
Lic. No. 20112
6.10.09
PROFESSIONAL ENGINEER

KEY PLAN

COMMONWEALTH OF VIRGINIA
EDMUND J. IGNACIO
Lic. No. 33579
4/27/11
PROFESSIONAL ENGINEER

SCALE

0' 30' 60'

No.	DATE	BY	Description
7	06.10.09	ARW	
6	06.05.09	ARW	
5	05.20.09	ARW	
4	04.20.09	ARW	
3	03.26.09	ARW	
2	02.19.09	ARW	
1	01.23.09	ARW	New Sheet

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TITLE

Inova
Willow Oaks

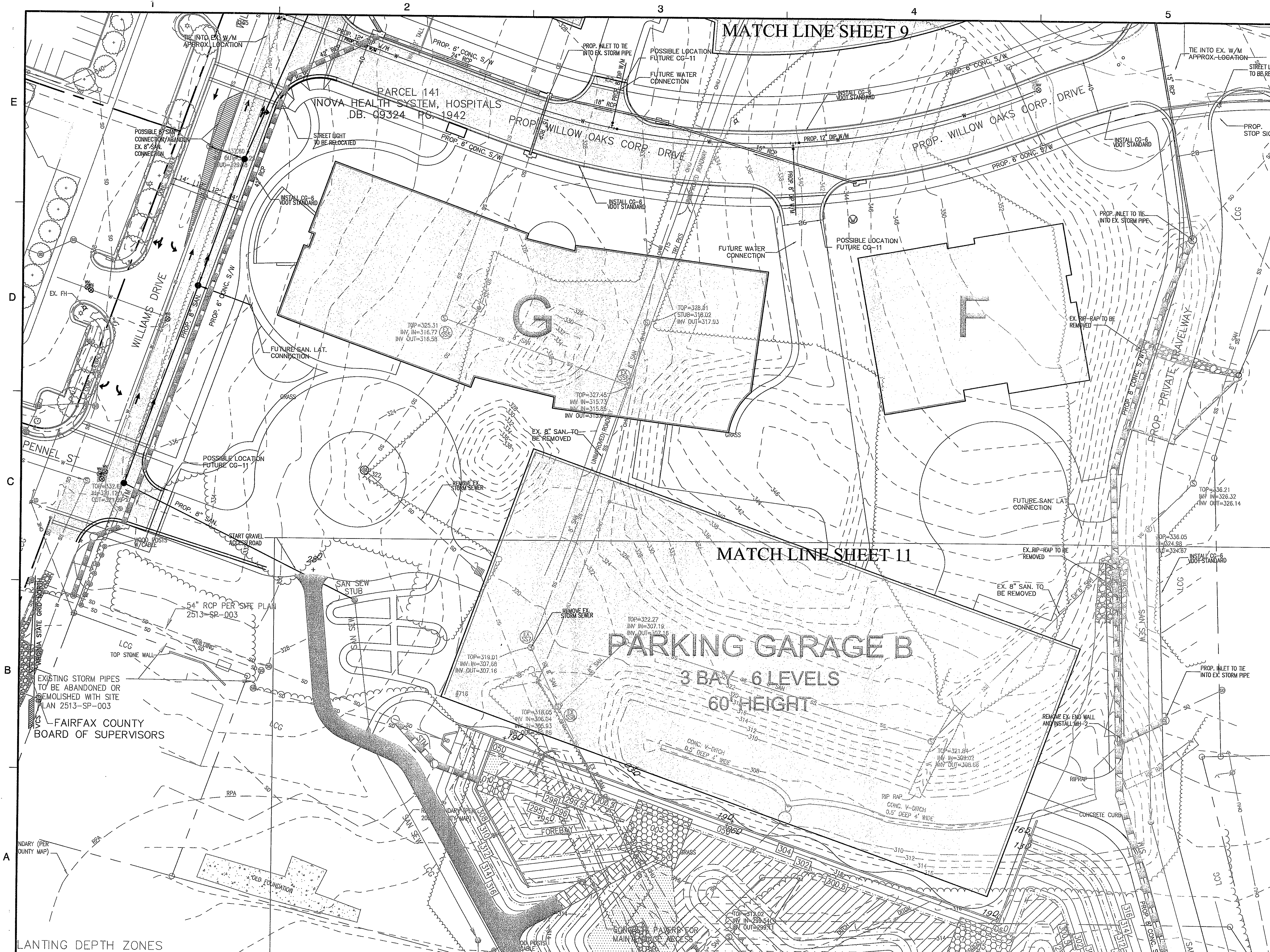
Partial Generalized Development Plan Amendment
Road Improvements Detail

PROJECT NO.

9

SHEET NO. 9 OF 20

M-10690


MATCH LINE SHEET 9
PARCEL 141
INOVA HEALTH SYSTEM, HOSPITALS
DB. 09324 PG. 1942
PROP. WILLOW OAKS CORP. DRIVE
WILLIAMS DRIVE
PENNEL ST
G
F
PARKING GARAGE B
3 BAY 6 LEVELS
60' HEIGHT
MATCH LINE SHEET 11
TIE INTO EX. W/M APPROX. LOCATION
STREET LIGHT TO BE RELOCATED
POSSIBLE LOCATION FUTURE CG-11
FUTURE WATER CONNECTION
PROP. INLET TO TIE INTO EX. STORM PIPE
INSTALL CG-6 VDOT STANDARD
FUTURE SAN. LAT. CONNECTION
EX. 8" SAN. TO BE REMOVED
REMOVE EX. STORM SEWER
PROP. PRIVATE TRAVELWAY
PROP. STOP SIGN
EX. RIP-RAP TO BE REMOVED
REMOVE EX. END WALL AND INSTALL MH-2
54" RCP PER SITE PLAN 2513-SP-003
EXISTING STORM PIPES TO BE ABANDONED OR DEMOLISHED WITH SITE PLAN 2513-SP-003
FAIRFAX COUNTY BOARD OF SUPERVISORS
SAN SEW STUB
START GRAVEL ACCESS ROAD
CONC. V-DITCH 0.5' DEEP 4' WIDE
RIP RAP
FOREBAY
CONCRETE PAVERS FOR MAINTENANCE ACCESS
OLD FOUNDATION
LANTING DEPTH ZONES
TOP STONE WALL
CONCRETE CURB
VIRGINIA STATE GRID NORTH

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Sheet 14 of 24

INOVA WILLOW OAKS

PARTIAL GENERALIZED DEVELOPMENT PLAN AMENDMENT
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4/27/11

SCALE
0' 30' 60'

No.	DATE	BY	Description
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5	06.05.09	ARW	
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3	04.20.09	ARW	
2	03.26.09	ARW	
1	02.19.09	ARW	New Sheet

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TITLE
Inova
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Partial Generalized Development Plan Amendment
Road Improvements Detail

PROJECT NO.

10

SHEET NO. 10 OF 20
M-10690

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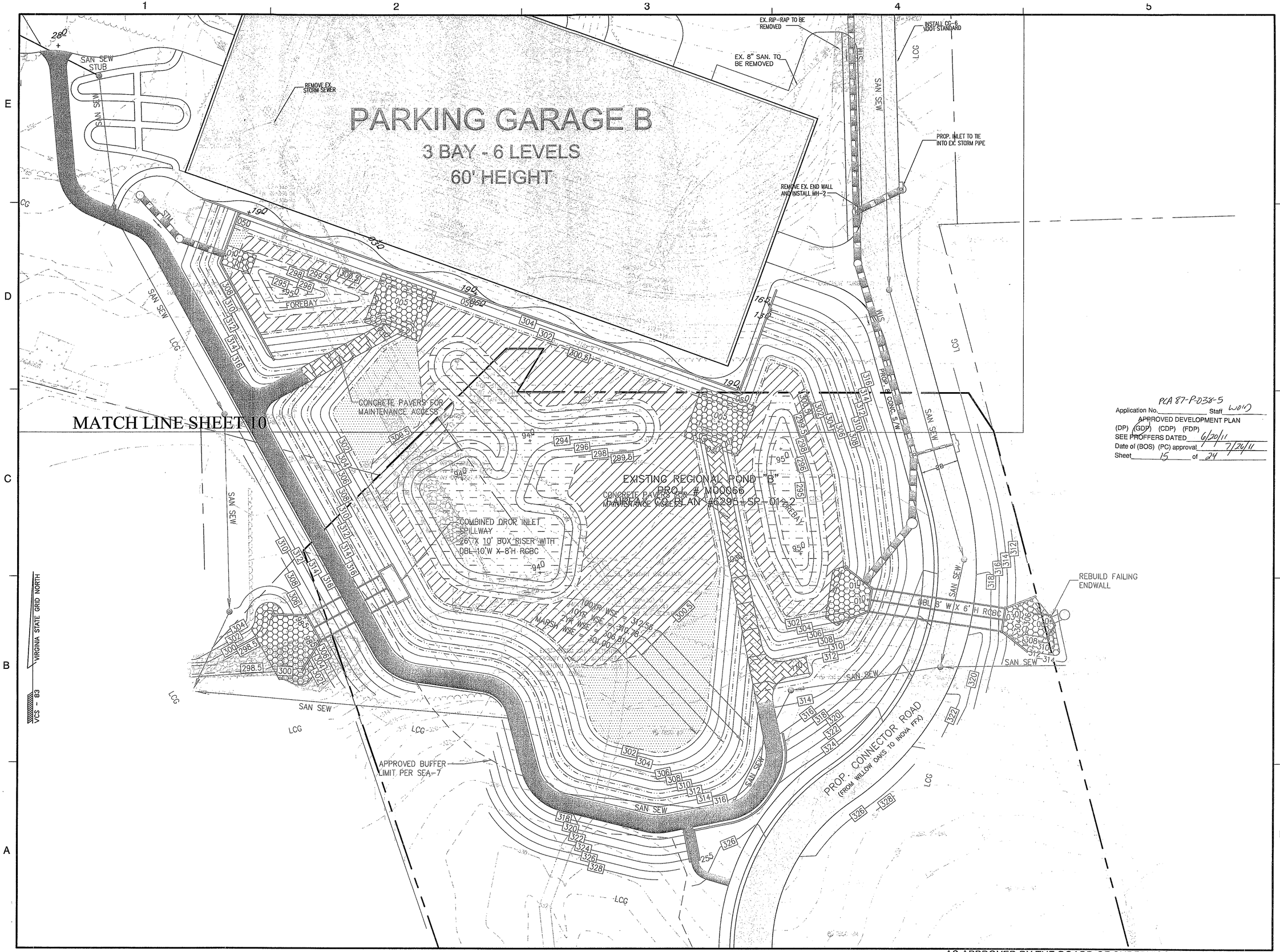

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PCA 87-P-038-5
Application No. _____ Staff WOID
APPROVED DEVELOPMENT PLAN
(DP) (GDP) (CDP) (FDP)
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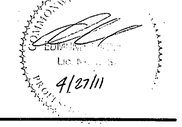
Sheet 15 of 24

KEY PLAN



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3	04.20.09	ARW	
2	03.26.09	ARW	
1	02.19.09	ARW	New Sheet

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DATE April 14, 2008

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Inova
Willow Oaks

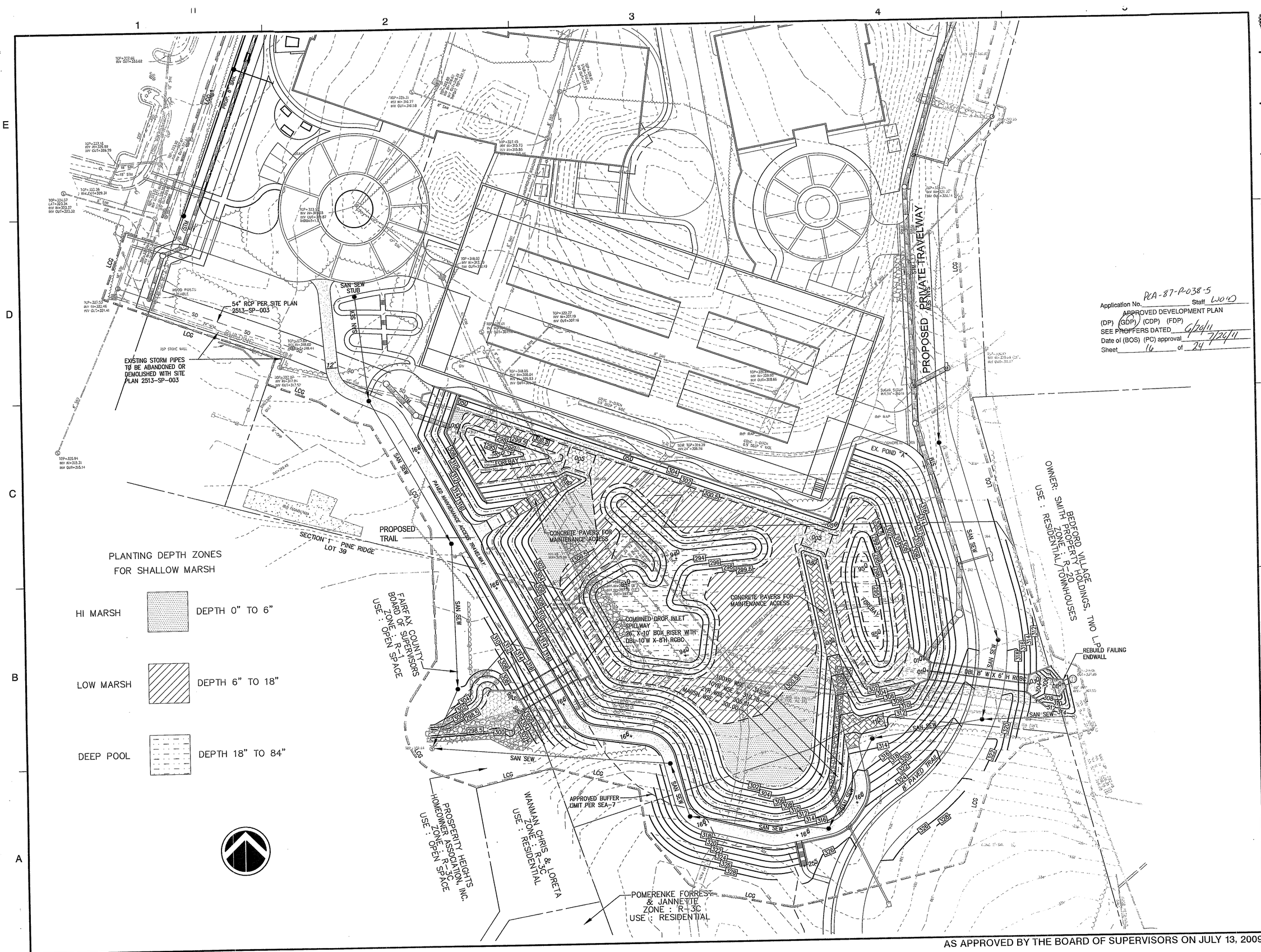
Partial Generalized Development Plan Amendment
Road Improvements Detail

PROJECT NO.

11

SHEET NO. 11 OF 20

M-10690



Application No. PCA-87-P-038-5 Staff WOLD
APPROVED DEVELOPMENT PLAN
(DP) (GDP) (CDP) (FDP)
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EMMANUEL IGNACIO
Lic. No. 33578
4/27/11

SCALE
0' 40' 80'

No.	DATE	BY	Description
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9	06.05.09	ARW	
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4	01.23.09	ARW	
3	10.09.08	ARW	
2	08.28.08	ARW	
1	07.31.08	ARW	

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APPROVED BY PGY
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DATE April 14, 2008

TITLE

Inova
Willow Oaks

Partial Generalized Development
Stormwater Management
Grading Plan - Pond Options 1,2,3

PROJECT NO.

12

SHEET NO. 12 OF 20

M-10690

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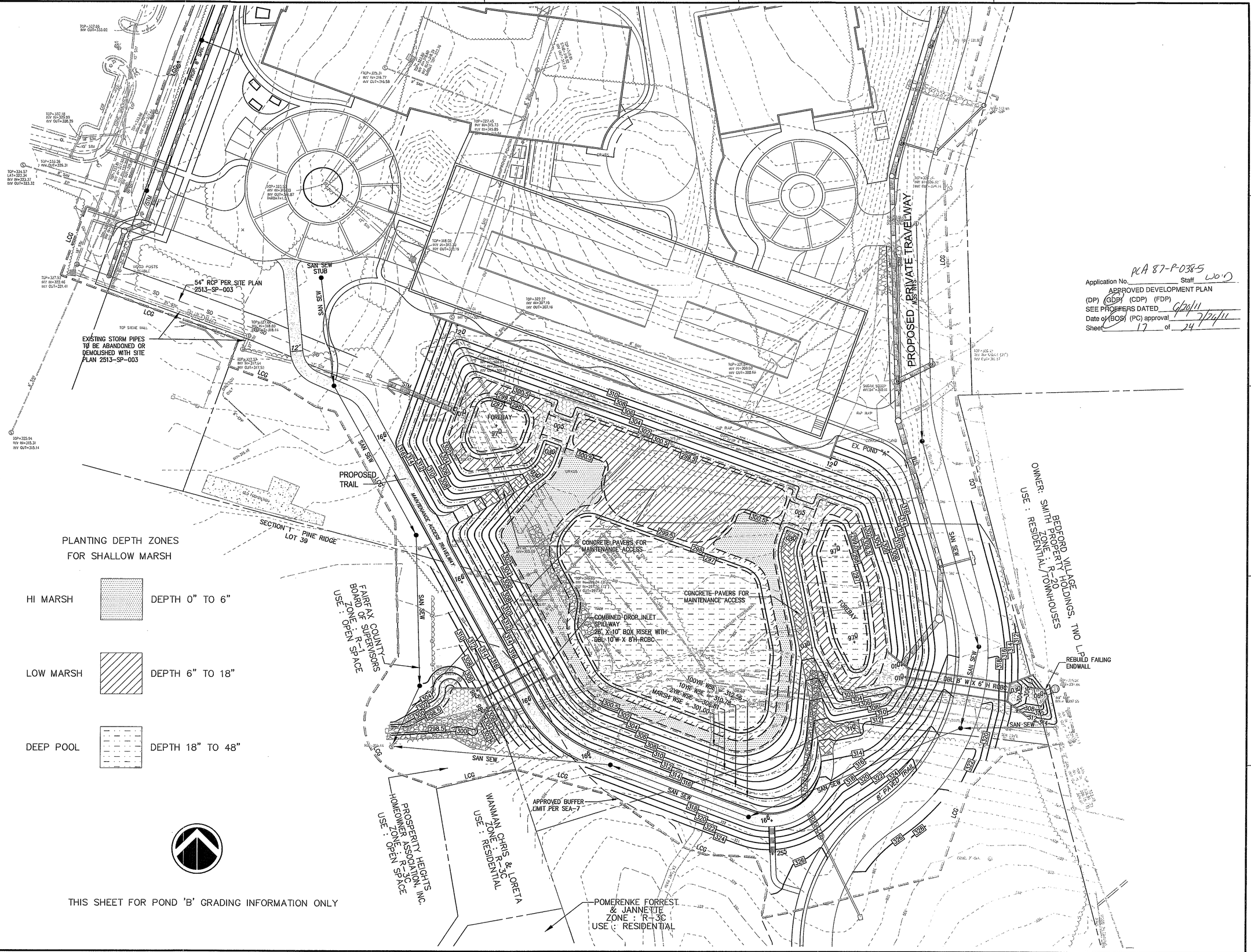

Application No. PCA 87-P-038-5 Staff WO'D

APPROVED DEVELOPMENT PLAN

(DP) (GDP) (CDP) (FDP)

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Date of (BOS) (PC) approval 7/26/11

Sheet 17 of 24

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INOVA WILLOW OAKS

PARTIAL GENERALIZED DEVELOPMENT PLAN AMENDMENT

PROVIDENCE DISTRICT
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PROFESSIONAL ENGINEER

SCALE

0' 40' 80'

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DATE	April 14, 2008

TITLE

Inova
Willow Oaks

Partial Generalized Development
Stormwater Management
Grading Plan - Pond Option 4

PROJECT NO.

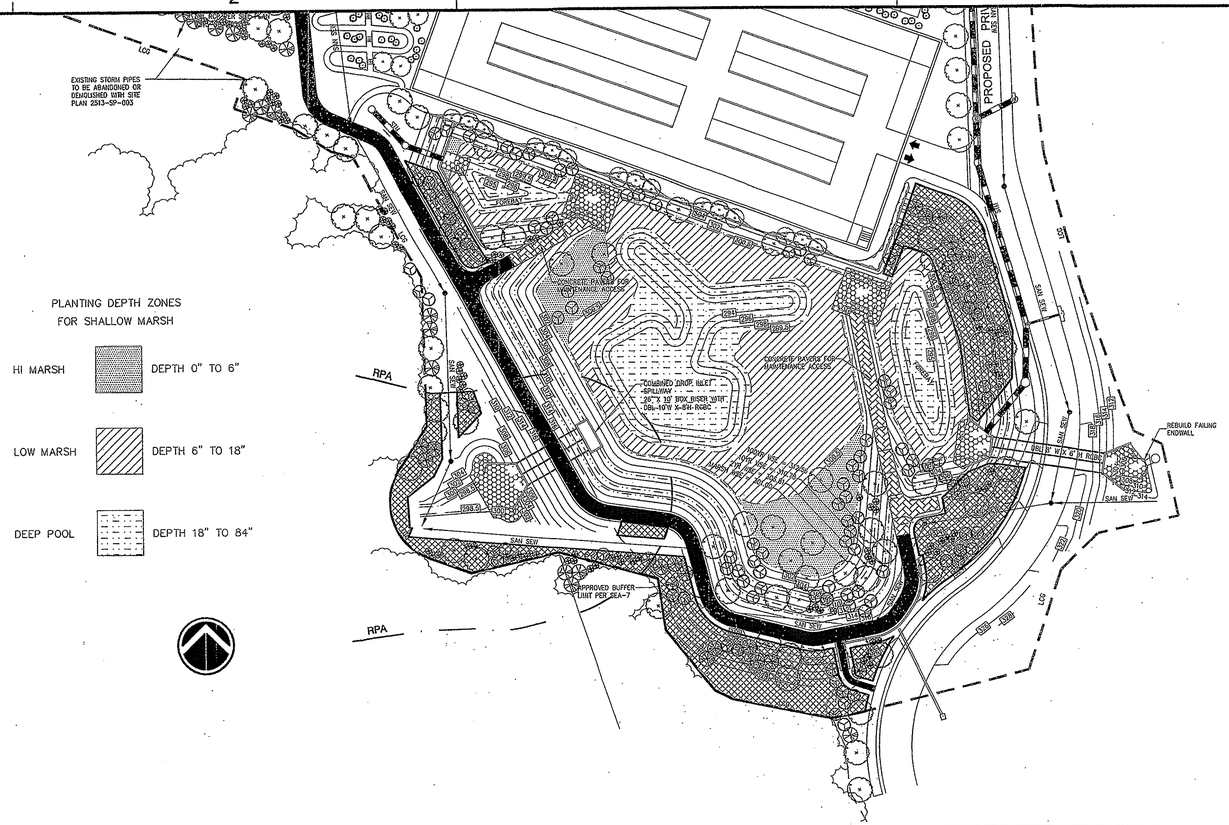
13

SHEET NO. 13 OF 20

M-10690

Option 1,2,3 - 3 Bay Garage
Legend

- PROPOSED LARGE DECIDUOUS TREE (Category III and IV Deciduous trees)
- PROPOSED EVERGREEN TREE (Category III and IV Evergreen trees)
- PROPOSED EVERGREEN TREE (Category I and II Evergreen trees)
- PROPOSED ORNAMENTAL TREE (Category I and II Deciduous trees)
- APPROXIMATE LIMITS OF CLEARING AND GRADING
- PROPOSED RIPARIAN REVEGETATION AREA

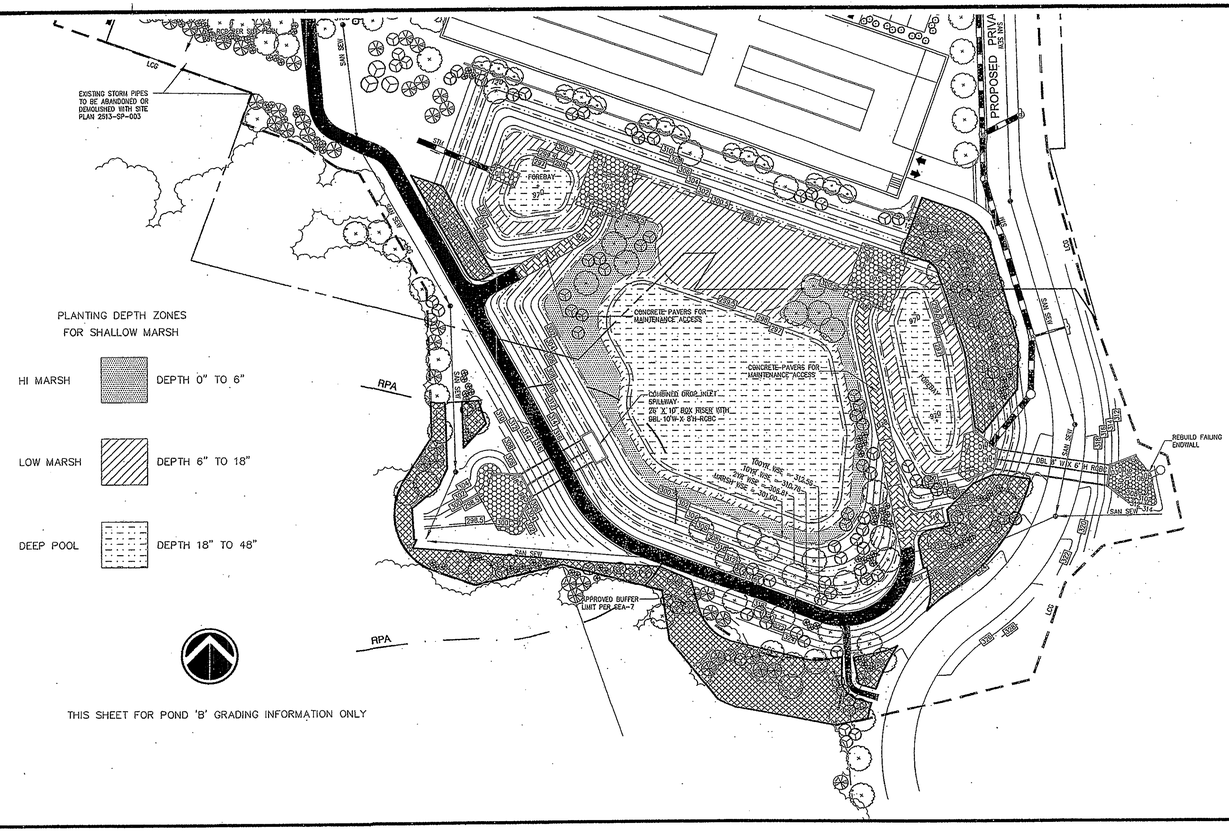


PLANTING DEPTH ZONES FOR SHALLOW MARSH

HI MARSH	DEPTH 0" TO 6"
LOW MARSH	DEPTH 6" TO 18"
DEEP POOL	DEPTH 18" TO 84"

Option 4 - 2 Bay Garage
Legend

- PROPOSED LARGE DECIDUOUS TREE (Category III and IV Deciduous trees)
- PROPOSED EVERGREEN TREE (Category III and IV Evergreen trees)
- PROPOSED EVERGREEN TREE (Category I and II Evergreen trees)
- PROPOSED ORNAMENTAL TREE (Category I and II Deciduous trees)
- APPROXIMATE LIMITS OF CLEARING AND GRADING
- PROPOSED RIPARIAN REVEGETATION AREA



PLANTING DEPTH ZONES FOR SHALLOW MARSH

HI MARSH	DEPTH 0" TO 6"
LOW MARSH	DEPTH 6" TO 18"
DEEP POOL	DEPTH 18" TO 48"

THIS SHEET FOR POND 'B' GRADING INFORMATION ONLY

Application No. PCA 87-P-038-5 Staff WO'D
APPROVED DEVELOPMENT PLAN
(DP) (GDP) (CDP) (FDP)
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Sheet 18 of 24

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INOVA
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PARTIAL GENERALIZED DEVELOPMENT PLAN AMENDMENT

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FAIRFAX COUNTY, VIRGINIA

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KEY PLAN

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EDMUND J. IGNACIO
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4/27/11
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SCALE

0' 60' 120'

No.	DATE	BY	Description
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3	10.09.08	ARW	
2	08.28.08	ARW	
1	07.31.08	ARW	

REVISIONS

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TITLE

Inova
Willow Oaks

Partial Generalized Development
Landscape Plan -
Pond Option 1,2,3,4

PROJECT NO.

14

SHEET NO. 14 OF 20

M-10690

INOVA WILLOW OAKS

STORMWATER MANAGEMENT NARRATIVE

The INOVA Willow Oaks site is located in the Accotink Creek watershed. The existing site is mostly undeveloped woods. There are two existing dry ponds on the site: Pond A and Pond B, a quasi-regional pond. This plan proposes the development of the Willow Oaks. SWM is required for the proposed improvements in the form of quality and quantity control. Runoff from the site will be conveyed to an enhanced extended detention dry pond hereinafter referred to as the Willow Oaks SWM/BMP Pond.

Existing Conditions – Pond A and Pond B

Existing Pond B is located on the site east of Williams Drive and south of Willow Oaks Corporate Center Drive. This pond was designed by Rinker-Detwiler and Associates, P.C. in 1986 (Plan #6295-SP-01-2) and is one of the first "regional" facilities constructed in the County. It was designed as a detention only dry pond and currently does not provide BMP. New development in the watershed of Pond B is currently covered for detention, but BMP must be provided by other means (i.e. sand filters, dedicated conservation easements, etc.). In comparison to today's PFM requirements for pond facilities, criteria used in designing Pond B are outdated. For example, the hydrology used to size the outlet works, emergency spillway and set the top of dam are all based on 2-hour storm durations. Under current PFM criteria this is acceptable for drainage areas less than 20 acres but Pond B has a drainage area of approximately 130.1 acres. The outlet works of Pond B consists of a riser with outlet conduit and an emergency spillway placed in the fill section of the dam, which is armored by riprap covered by approximately 1'-2' of earth.

Immediately north and adjacent to existing Pond B is Pond A. Pond A, which drains into Pond B, is also a detention only dry pond. Pond A was designed in accordance with current PFM criteria by Dewberry in 1993 (Plan # 5544-SP-04). The outlet works of Pond A consists of a combined drop inlet principle/emergency spillway including a riser and outlet conduit. Willow Oaks, Bedford Village, north end of INOVA Fairfax Hospital Campus, and some businesses along Williams Drive as well as parts of VA Route 50 all drain to existing Pond A and/or Regional Pond B.

Proposed Willow Oaks SWM/BMP Pond

As part of this development application, it is proposed that existing Pond A and Pond B be combined into one SWM/BMP facility that consists of an enhanced extended detention dry pond that meets current PFM design criteria. The proposed facility will be privately owned and maintained. The proposed facility will include sediment forebays at major inflow points and a shallow marsh area consisting of a micro pool as well as high and low marshes. The outlet works will consist of a combined drop inlet principle/emergency spillway in the form of a riser and outlet conduit. The proposed dam embankment will be approximately 18' high with less than 50 ac-ft of storage to the top of the dam and will not be State regulated. Concept grading plans of the proposed facility are provided in this application.

The proposed facility is designed to provide peak flow reduction for the 2- and 10-year storms from developed conditions to good forested conditions for the entire 130.1 acre watershed it serves. Further, the proposed facility is designed to exceed the minimum phosphorous removal requirement for the 130.1 acre watershed it serves by providing 50 % phosphorous removal efficiency - the minimum required is 40 % for this particular location in the County. As demonstrated by the phosphorous removal computations provided, the proposed facility provides enough BMP to cover the entire 130.1 acre watershed it serves (including the INOVA Willow Oaks site) plus the INOVA Fairfax Hospital site. Though the southern portion of the INOVA Fairfax Hospital site along Woodburn Road does not drain to the proposed facility, BMP credit is requested as part of the INOVA Fairfax Hospital development application in lieu of having to design, build and maintain large sand filter systems.

Willow Oaks SWM/BMP Detention Summary

	Drainage Area (acres)	Peak Flow (cfs) 2-year	10-year
Good Forested Conditions	130.1	39	173
Ultimate Conditions	130.1		
• Into proposed facility		345	636
• Out of proposed facility		34	106
Over-detention provided		5	67

Willow Oaks SWM/BMP Water-Surface Elevation Summary

	Combined PSW/ESW PSW Top	ESW Top	Dam Top	WSE	Freeboard
Marsh pool	307.00 ft	310.75 ft	316.62 ft	301.00 ft	15.62 ft
BMP pool	307.00 ft	310.75 ft	316.62 ft	304.50 ft	12.12 ft
2-year pool	307.00 ft	310.75 ft	316.62 ft	306.81 ft	9.81 ft
10-year pool	307.00 ft	310.75 ft	316.62 ft	310.78 ft	5.84 ft
100-year pool	307.00 ft	310.75 ft	316.62 ft	312.56 ft	4.06 ft
1.5 x 100-year pool (S.D.F.)	307.00 ft	310.75 ft	316.62 ft	314.60 ft	2.02 ft
2.5 x 100-year pool (F.B.H)	307.00 ft	310.75 ft	316.62 ft	316.19 ft	0.43 ft

Where: PSW = Principal Spillway ESW = Emergency Spillway WSE = Water-surface elevation

Floodplain

There is a regulated minor floodplain onsite at the proposed Willow Oaks SWM/BMP Pond. Accordingly, a Floodplain Study will be prepared and submitted at Site Plan. The proposed Willow Oaks SWM/BMP Pond will reflect a decrease in its 100-year flood elevation when compared to existing conditions and will not impact adjacent properties. This decrease is a result of increased storage and spillway capacity associated with the proposed facility. A summary of the 100-year water-surface elevations is provided as follows:

100-Year Water-Surface Elevation Summary

Existing Pond A	316.28 ft	See Existing Conditions HEC-1 Model
Existing Regional Pond B	313.69 ft	See Existing Conditions HEC-1 Model
Proposed Willow Oaks SWM/BMP Pond	312.56 ft	See Ultimate Conditions HEC-1 Model

Low Impact Development

The Applicant shall install Fairfax County accepted Low Impact Development (LID) facilities on the Application Property in at least one of the potential locations shown on this development plan. The LID facilities (pervious pavement or other) shall treat a combined total of 20,000 square feet of impervious surface and shall have a minimum phosphorous removal efficiency of 40 percent. The LID facilities will be designed in accordance with the PFM. These LID facilities are intended as demonstration facilities and shall not factor into the requisite calculations for stormwater management and BMPs.

INOVA WILLOW OAKS

STORMWATER OUTFALL NARRATIVE

Description of Existing Outfall

The Willow Oaks development has one outfall The outfall channel begins at the proposed Willow Oaks SWM/BMP pond and proceeds in a southerly direction approximately 4,500 feet where it confluences with Accotink Creek. At Accotink Creek the drainage area is approximately 15 square miles. Based on field observations, the channel is predominantly natural channel, lightly meandering, 10'-15' wide bottom width, varying 3'-4' deep, and steep side slopes (1:1) Approximately 1500' of the outfall channel located just upstream of the Highland Lane culvert crossing was improved to reflect riprap and gabions to create an engineered rectangular channel. In addition, the Highland Lane culvert was upgraded to a triple 6' x 6' box culvert as part of that project. There are no signs of erosion at either the inlet or outlet of this culvert. These channel and culvert improvements were implemented by the County as recommended in the Parsons Brinckerhoff, Quade & Douglas report entitled, "Accotink Creek Watershed Immediate Action Plan", dated April 1978. Downstream of Highland Lane, the channel is natural and ends at Accotink Creek.

Description of Outfall Adequacy Requirements

In an effort to exceed minimum PFM requirements, NRCS Hydrology was used with a 24-hour duration storm for the 2-, 10- and 100-year events. This exceeds the minimum 2-hour duration storm as given under PFM section 6-1301.5. Using NRCS Hydrology, a rainfall-runoff model was developed using HEC-1 to determine 2-, 10- and 100-year peak flows at multiple points along the site outfall. Cross section computations for permissible velocity and channel capacity assuming normal depth were performed and the Highland Road culvert was checked for capacity and freeboard. In addition, the 100-year flood elevation was determined for each cross section and the resulting 100-year floodplain was mapped. The limits of the site outfall studied, cross section locations, and developed 100-year floodplain limits are provided in this Application. Under developed conditions (i.e. proposed Willow Oaks SWM/BMP facility with fully developed watershed), the outfall analysis reflects 5 key points:

1. All representative cross sections are adequate in terms of permissible velocity for the 2-yr storm.
2. All representative cross sections are adequate in terms of channel capacity with the exception of cross section 4 that represents the existing gabion-lined channel located just upstream of Highland Road. Here the 10-year storm is determined to be out of bank while the 2-year storm is contained.
3. All representative cross sections are adequate in terms of 100-year flooding with the exception of cross section 4 that represents the existing gabion-lined channel located just upstream of Highland Road. Here the 100-year floodplain encroaches on a single home.
4. The Highland Road culvert crossing is adequate for 10-year capacity and freeboard.
5. Even if the proposed Willow Oaks SWM/BMP facility could be designed to have infinite capacity, analysis confirms that the 10-year storm would still remain out of bank as described under point 2, and the home identified under point 3 would still flood at cross section 4. The analysis shows that this condition exists because the drainage that accumulates downstream of the Willow Oaks SWM/BMP facility is sufficient enough for the 10-year storm to exceed the capacity of the gabion-lined channel and also cause 100-year flooding of the home.

Given point 5 above, it can be concluded that increasing storage capacity at the proposed Willow Oaks SWM/BMP facility will not solve the existing 10-year capacity and 100-year flooding issues at the gabion-lined channel reflected by cross section 4. For these reasons it is appropriate to apply the concept of "no adverse impact and proportional improvement". That said the channel capacity method (PFM section 6-0203.4B) and 100-year flooding method (PFM section 6-0203.5) were used to evaluate proportional improvements. The proportional improvement computations for cross section 4 are found on this sheet.

The outfall analysis demonstrates that the proposed Willow Oaks SWM/BMP facility provides the required detention to demonstrate no adverse impact and proportional improvement for channel capacity and 100-year flooding at cross section 4. For these reasons, it is our judgment that the site outfall downstream of the development site together with the proposed Willow Oaks SWM/BMP facility function as an acceptable drainage system in accordance with criteria set forth in the PFM.

A summary of the natural and manmade channel adequacy along the study reach is given in Tables 1, 2 and 3 below.

Table 1 – Channel Capacity Check (Developed Conditions)

Section	Channel n-value	Max Capacity (cfs)	Flow (cfs)	Comments
1 (natural)	0.045 [A]	662	49 (2-yr)	capacity is adequate
2 (natural)	0.045 [A]	374	98 (2-yr)	capacity is adequate
3 (natural)	0.045 [A]	226	187 (2-yr)	capacity is adequate
4 (gabions)	**0.037 [B]**	**307**	**499 (10-yr)**	**capacity not adequate [D]**
5 (natural)	0.058 [C]	246	216 (2-yr)	capacity is adequate
6 (natural)	0.058 [C]	269	216 (2-yr)	capacity is adequate

Table 2 – Channel Velocity Check (Developed Conditions)

Section	Permissible Velocity (fps)	Velocity (fps)	Comments
1 (natural)	5.5 [E]	2.8 (2-yr)	velocity is adequate
2 (natural)	5.5 [E]	3.6 (2-yr)	velocity is adequate
3 (natural)	5.5 [E]	4.0 (2-yr)	velocity is adequate
4 (gabions)	>8.0	6.2 (2-yr)	velocity is adequate
5 (natural)	5.5 [E]	4.0 (2-yr)	velocity is adequate
6 (natural)	5.5 [E]	3.7 (2-yr)	velocity is adequate

Table 3 – 100-Year Water-Surface Elevation at Outfall Sections

Section	WSEL (ft)	Section	WSEL (ft)
1	299.36	**4**	**284.92 [F] (100-year floods single home at Sec. 4)**
2	293.49	5	274.86
3	289.54	6	269.08

Where:

A : n = n1 + n2 + n3 + n4 + n5 + n6 = 0.02 + 0.010 + 0.00 + 0.01 + 0.005 + 0.00 = 0.045 (per Tables 5-16 - 5-21 of VA E&S Control Handbook)
B : n = 0.037 = weighted average of gabion sides (n=0.030) and stone bottom (n=0.045)
C : n = n1 + n2 + n3 + n4 + n5 + n6 = 0.02 + 0.010 + 0.005 + 0.01 + 0.005 + 0.0075 = 0.058 (per Tables 5-16 - 5-21 of VA E&S Control Handbook)
D : See computations for demonstration of no adverse impact and proportional improvement for channel capacity.
E : Per Table 5-22 of VA E&S Control Handbook for field verified soil type of Graded, Silt to Cobbles (noncolloidal).
F : See computations for demonstration of no adverse impact and proportional improvement for 100-year flooding.

Opinion of Outfall Adequacy

Based on these computation and field observations of the outfall, it is the opinion of the engineer that:

1. Cross sections shown are reflective of the stream reach analyzed.
2. Adequacy of the downstream drainage system is met within the extent of review and the proposed Willow Oaks SWM/BMP facility provides the required detention to demonstrate no adverse impact and proportional improvement for 10-year channel capacity and 100-year flooding at cross section 4 where the 10-year storm is out of bank and a single home is flooded by the 100-year storm.
3. There will be no flooding of existing downstream dwellings, or buildings constructed under an approved building permit by the 100-year storm event with the exception of the home described under point 2 above.

WILLOW OAKS OUTFALL ANALYSIS FOR PROPOSED SWM/BMP POND
PROPORTIONAL IMPROVEMENT
CHANNEL CAPACITY METHOD

INADEQUATE CAPACITY SECTION 4

GIVEN:

Ad	=	Contributing drainage area of site	=	21.55 acres
Acs	=	Contributing drainage area to section	=	267.4 acres
CNd	=	Post run-off curve number for site	=	89
CNcs	=	Existing runoff curve number to section	=	83

THE CORRESPONDING PROPORTIONAL IMPROVEMENT IS CALCULATED AS:

$$Pi = \frac{Cd\ Ad}{Ccs\ Acs} \times 100$$

Johnson and Meadows (1980) had developed and equation for converting CN values to C value:

$$C = 1 - \frac{S\,[1.2 - S/(P+0.8S)]}{P}$$

where: $S = (1000/CN) - 10$

STORM EVENT	2-YR	OVERTOPPING	10-YR
P (inches)	3.20	3.30	5.20
CNd	89	89	89
Sd (inches)	1.236	1.236	1.236
Cd	0.65	0.66	0.76
CNcs	83	83	83
Scs	2.0482	2.0482	2.0482
Ccs	0.60	0.51	0.65
Ad (acres)	21.55	21.55	21.55
Acs (acres)	267.40	267.40	267.40
Existing peak flow at section (cfs)	234.00	250.00	568.00
Pi (%)	10.48	10.43	9.42
Allowable peak flow at section (cfs)	209	224	514
Provided peak flow at section (cfs)	187	202	499

WILLOW OAKS OUTFALL ANALYSIS FOR PROPOSED SWM/BMP POND
PROPORTIONAL IMPROVEMENT

100-YR FLOODING AT SECTION 4

GIVEN:

Ad	=	Contributing drainage area of site	=	21.55 acres
Acs	=	Contributing drainage area to section	=	267.4 acres
CNd	=	Post run-off curve number for site	=	89
CNcs	=	Existing runoff curve number to section	=	83

THE CORRESPONDING PROPORTIONAL IMPROVEMENT IS CALCULATED AS:

$$Pi = \frac{Cd\ Ad}{Ccs\ Acs} \times 100$$

Johnson and Meadows (1980) had developed and equation for converting CN values to C value:

$$C = 1 - \frac{S\,[1.2 - S/(P+0.8S)]}{P}$$

where: $S = (1000/CN) - 10$

STORM EVENT	100-YR
P (inches)	7.30
CNd	89
Sd (inches)	1.236
Cd	0.82
CNcs	83
Scs	2.0482
Ccs	0.73
Ad (acres)	21.55
Acs (acres)	267.40
Existing peak flow leaving pond (cfs)	594.00
Pi (%)	9.05
Allowable peak flow leaving pond (cfs)	540
Provided peak flow leaving pond (cfs)	532
Pre-dev. peak flow at section 4 (cfs)	1165
Post-dev. peak flow at section 4 (cfs)	1078

MINIMUM STORMWATER INFORMATION FOR REZONING, SPECIAL EXCEPTION, SPECIAL PERMIT AND DEVELOPMENT PLAN APPLICATIONS

The following information is required to be shown or provided in all zoning applications, or a waiver request of the submission requirement with justification shall be attached. Note: Waivers will be acted upon separately. Failure to adequately address the required submission information may result in a delay in processing this application.

This information is required under the following Zoning Ordinance paragraphs:

Special Permits (9-011 2J & 3L)	Special Exceptions (9-011 2J & 3L)
Cluster Subdivision (9-615 1G & 1N)	Commercial Revitalization Districts (9-622 2A (12) & 14))
Development Plans PRC District (16-302 3 & 4L)	PRC Plan (16-303 1E & 10)
FDP P Districts (except PRC) (16-502 1F & 10)	Amendments (18-202 10F & 10I)

☒ 1. Plat is at a minimum scale of 1" – 50' (unless it is depicted on one sheet with a minimum scale of 1" = 100'.

☒ 2. A graphic depicting the stormwater management facility(ies) and limits of clearing and grading accommodate the stormwater management facility(ies), storm drainage pipe systems and outlet protection, pond spillways, access roads, site outfalls, energy dissipation devices, and stream stabilization measures as shown on Sheet 4.

☒ 3. Provide:

Facility Name/ Type & No.	On-site area served (acres)	Off-site area served (acres)	Drainage area (acres)	Footprint area (sf)	Storage Volume (cf)	If pond, dam height (ft)
Dry Pond	16.13	113.97	130.1	206,200	1,879,800	18'
(e.g. dry pond A, infil, trench, underground, vault, etc.)						
Totals	16.13	113.97	130.1	206,200	1,879,800	18'

☒ 4. Onsite drainage channels, outfalls and pipe systems are shown on Sheet 3, 4. Pond inlet and outlet pipe systems are shown on Sheet 10.

☒ 5. Maintenance access (road) to stormwater management facility(ies) are shown on Sheet 10. Type of maintenance access road surface noted on the plat is 10 (e.g. asphalt, geoblock, gravel, etc.).

☒ 6. Landscaping and tree preservation shown in and near the stormwater management facility is shown on Sheet 12.

☒ 7. A stormwater management narrative which contains a description of how detention and best management practice requirements will be met is provided on Sheet 13.

☒ 8. A description of the existing conditions of each numbered site outfall extended downstream from the site to a point which is at least 100 times the site area or which has a drainage area of at least one square mile (640 acres) is provided on Sheet 13.

☒ 9. A description of how the outfall requirements, including contributing drainage areas of the Public Facilities Manual will be satisfied is provided on Sheet 13.

☒ 10. Existing topography with maximum contour intervals of two (2) feet and a note as to whether it is an air survey or field run is provided on Sheets 3.

☒ 11. A submission waiver is requested for N/A.

☒ 12. Stormwater management is not required because N/A.

Industry Letter 05-03 dated 02/02/05

RPA 87-P-038-5

Application No. _____ Staff WOID

APPROVED DEVELOPMENT PLAN
(DP) (GDP) (CDP) (FDP)
SEE PROFFERS DATED 6/29/11
Date of (BOS) (PC) approval 7/26/11
Sheet 19 of 24

AS APPROVED BY THE BOARD OF SUPERVISORS ON JULY 13, 2009

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INOVA WILLOW OAKS

PARTIAL GENERALIZED DEVELOPMENT PLAN AMENDMENT

PROVIDENCE DISTRICT
FAIRFAX COUNTY, VIRGINIA

SEAL

COMMONWEALTH OF VIRGINIA
TIMOTHY CHARLES CULLETON
Lic. No. 20112
6-10-09
PROFESSIONAL ENGINEER

KEY PLAN

COMMONWEALTH OF VIRGINIA
EDMUND J. IGNACIO
Lic. No. 33579
4/27/11
PROFESSIONAL ENGINEER

SCALE

No.	DATE	BY	Description
10	06.10.09	ARW	
9	06.05.09	ARW	
8	05.20.09	ARW	
7	04.20.09	ARW	
6	03.26.09	ARW	
5	02.19.09	ARW	
4	01.23.09	ARW	
3	10.09.08	ARW	
2	08.28.08	ARW	
1	07.31.08	ARW	

REVISIONS

DRAWN BY SCC
APPROVED BY PGY
CHECKED BY TCC
DATE April 14, 2008

TITLE

Inova
Willow Oaks

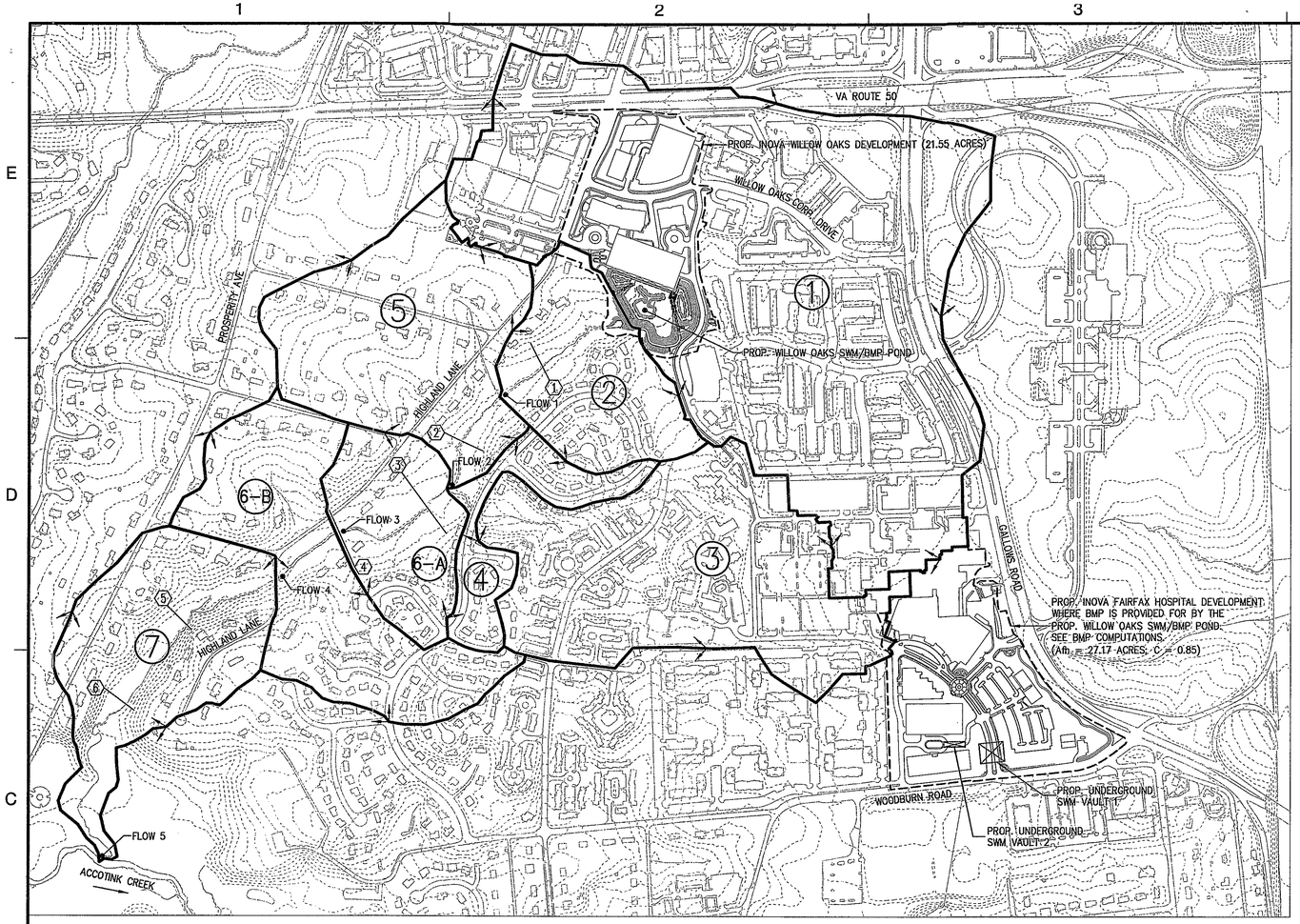
Partial Generalized Development
Stormwater Management
and Outfall Narratives

PROJECT NO.

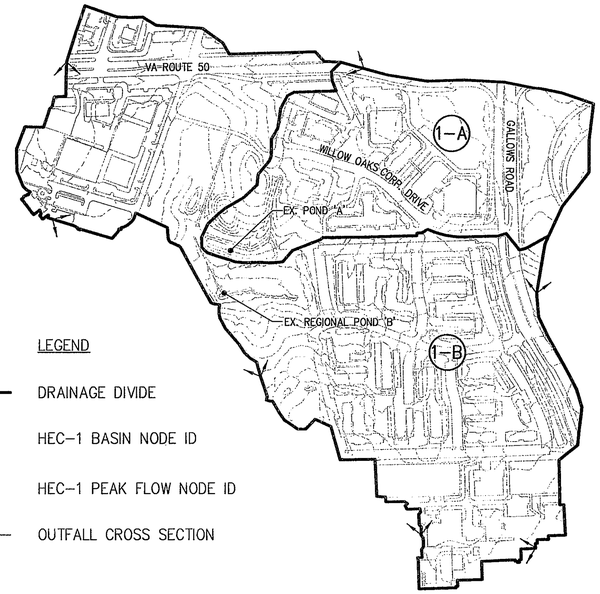
15

SHEET NO. 15 OF 20

M-10690



DEVELOPED CONDITIONS TO PROPOSED WILLOW OAKS SWM/BMP POND AND OUTFALL TO ACCOTINK CREEK
SCALE: 1" = 400'



LEGEND

- DRAINAGE DIVIDE
- (1) HEC-1 BASIN NODE ID
- FLOW 3 • HEC-1 PEAK FLOW NODE ID
- (3) OUTFALL CROSS SECTION

EXISTING CONDITIONS TO EXISTING REGIONAL POND 'B'
SCALE: 1" = 400'

HYDROLOGIC DATA

HEC-1 BASIN NODE ID	ACRES	RCN	Tc (min)
1-A	37.1	84	10
1-B	93.0	87	10
1 (FORESTED)	130.1	62	25
1 (DEVELOPED)	130.1	89	10
2	21.7	75	10
3	51.1	82	10
4	10.2	73	10
5	37.3	77	15
6-A	17.0	77	10
6-B	33.6	71	15
7	30.7	73	10

NRCS 24-HOUR PEAK FLOW SUMMARY ALONG WILLOW OAKS OUTFALL TO ACCOTINK CREEK

LOCATION **	2-YEAR PRE-DEV	2-YEAR POST-DEV	10-YEAR PRE-DEV	10-YEAR POST-DEV	100-YEAR PRE-DEV	100-YEAR POST-DEV
FLOW-1	96	49	278	136	689	600
FLOW-2	145	98	362	251	877	789
FLOW-3	234	187	568	499	1165	1078
FLOW-4	257	209	624	564	1255	1165
FLOW-5	263	216	628	558	1230	1145

** LOCATIONS SHOWN ON MAP THIS SHEET. ALSO REFER TO EXISTING AND ULTIMATE CONDITIONS HEC-1 MODELS PROVIDED IN THIS APPLICATION.

DEVELOPED CONDITIONS C-FACTOR TO PROP. WILLOW OAKS SWM/BMP POND

LAND USE	IMP (%)	ACRES	IMP x ACRES
COMMERCIAL	85	70.40	5984.0
OPEN SPACE	15	14.96	224.4
TOWNHOMES	70	34.57	2419.9
MAJOR ROADS	100	10.17	1017.0
		130.1	9645.3

IMP = 74 %

C = 0.05 + 0.009 (IMP) = 0.05 + 0.009 (74) = 0.72

Application No. RA 87-P-038-5 Staff WOJ
APPROVED DEVELOPMENT PLAN
(DP) (GDP) (CDP) (FDP)
SEE PROFFERS DATED 6/29/11
Date of (BOS) (PC) approval 7/13/11
Sheet 20 of 34

AS APPROVED BY THE BOARD OF SUPERVISORS ON JULY 13, 2009

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INOVA
WILLOW OAKS

PARTIAL GENERALIZED
DEVELOPMENT PLAN AMENDMENT

PROVIDENCE DISTRICT
FAIRFAX COUNTY, VIRGINIA

SEAL
COMMONWEALTH OF VIRGINIA
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COMMONWEALTH OF VIRGINIA
EDMUND J. IGNACIO
Lic. No. 33579
4/27/11
PROFESSIONAL ENGINEER

SCALE
AS SHOWN

No.	DATE	BY	Description
10	06.10.09	ARW	
9	06.05.09	ARW	
8	05.20.09	ARW	
7	04.20.09	ARW	
6	03.26.09	ARW	
5	02.19.09	ARW	
4	01.26.09	ARW	
3	10.09.08	ARW	
2	08.28.08	ARW	
1	07.31.08	ARW	

REVISIONS

DRAWN BY LNR
APPROVED BY PGY
CHECKED BY TCC
DATE April 14, 2008

TITLE
Inova
Willow Oaks
Partial Generalized Development
Drainage Divides
and Hydrologic Data

PROJECT NO.

16

SHEET NO. 16 OF 20

M-10690

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WILLOW OAKS OUTFALL ANALYSIS – CROSS SECTION COMPUTATION SUMMARY

Label	Discharge (ft³/s)	Channel Slope (ft/ft)	Roughness Coefficient	Normal Depth (ft)	Water Surface Elevation (ft)	Velocity (ft/s)
Cross Section 1: MAX Q	662.45	0.01000	0.045	4.18	297.83	6.72
Cross Section 1: 2YR	49.00	0.01000	0.045	1.11	294.76	2.80
Cross Section 1: 100YR	600.00	0.01000	0.087	5.71	299.36	2.64
Cross Section 2: MAX Q	373.55	0.00770	0.045	4.10	291.73	5.49
Cross Section 2: 2YR	98.00	0.00770	0.045	2.10	289.73	3.64
Cross Section 2: 100YR	789.00	0.00770	0.075	5.86	293.49	3.41
Cross Section 3: MAX Q	225.69	0.00650	0.045	3.12	287.15	4.20
Cross Section 3: 2YR	187.00	0.00650	0.045	2.85	286.88	3.98
Cross Section 3: 100YR	1078.00	0.00650	0.053	5.51	289.54	3.51
Cross Section 4: MAX Q	307.44	0.01040	0.037	3.95	282.60	7.28
Cross Section 4: 2YR	187.00	0.01040	0.038	3.01	281.66	6.21
Cross Section 4: 10YR	499.00	0.01040	0.030	5.09	283.74	5.40
Cross Section 4: 100YR	1078.00	0.01040	0.046	6.27	284.92	4.39
Cross Section 5: MAX Q	246.33	0.00800	0.058	3.50	273.01	4.22
Cross Section 5: 2YR	216.00	0.00800	0.058	3.26	272.77	4.05
Cross Section 5: 100YR	1145.00	0.00800	0.078	5.35	274.86	3.39
Cross Section 6: MAX Q	268.73	0.00800	0.058	3.35	267.12	3.98
Cross Section 6: 2YR	216.00	0.00800	0.058	3.01	266.78	3.69
Cross Section 6: 100YR	1145.00	0.00800	0.067	5.31	269.08	3.41

HY-8 Culvert Analysis Report for Highland Lane

Site Data - 3-6X6 BOX AT HIGHLAND LANE

Site Data Option: Culvert Invert Data
Inlet Station: 0.00 ft
Inlet Elevation: 274.71 ft
Outlet Station: 42.00 ft
Outlet Elevation: 274.50 ft
Number of Barrels: 3

Culvert Data Summary - 3-6X6 BOX AT HIGHLAND LANE

Barrel Shape: Concrete Box
Barrel Span: 6.00 ft
Barrel Rise: 6.00 ft
Barrel Material: Concrete
Barrel Manning's n: 0.0130
Inlet Type: Conventional
Inlet Edge Condition: 1:1 Bevel (45° flare) Wingwall
Inlet Depression: None

Roadway Data for Crossing: EX HIGHLAND LANE

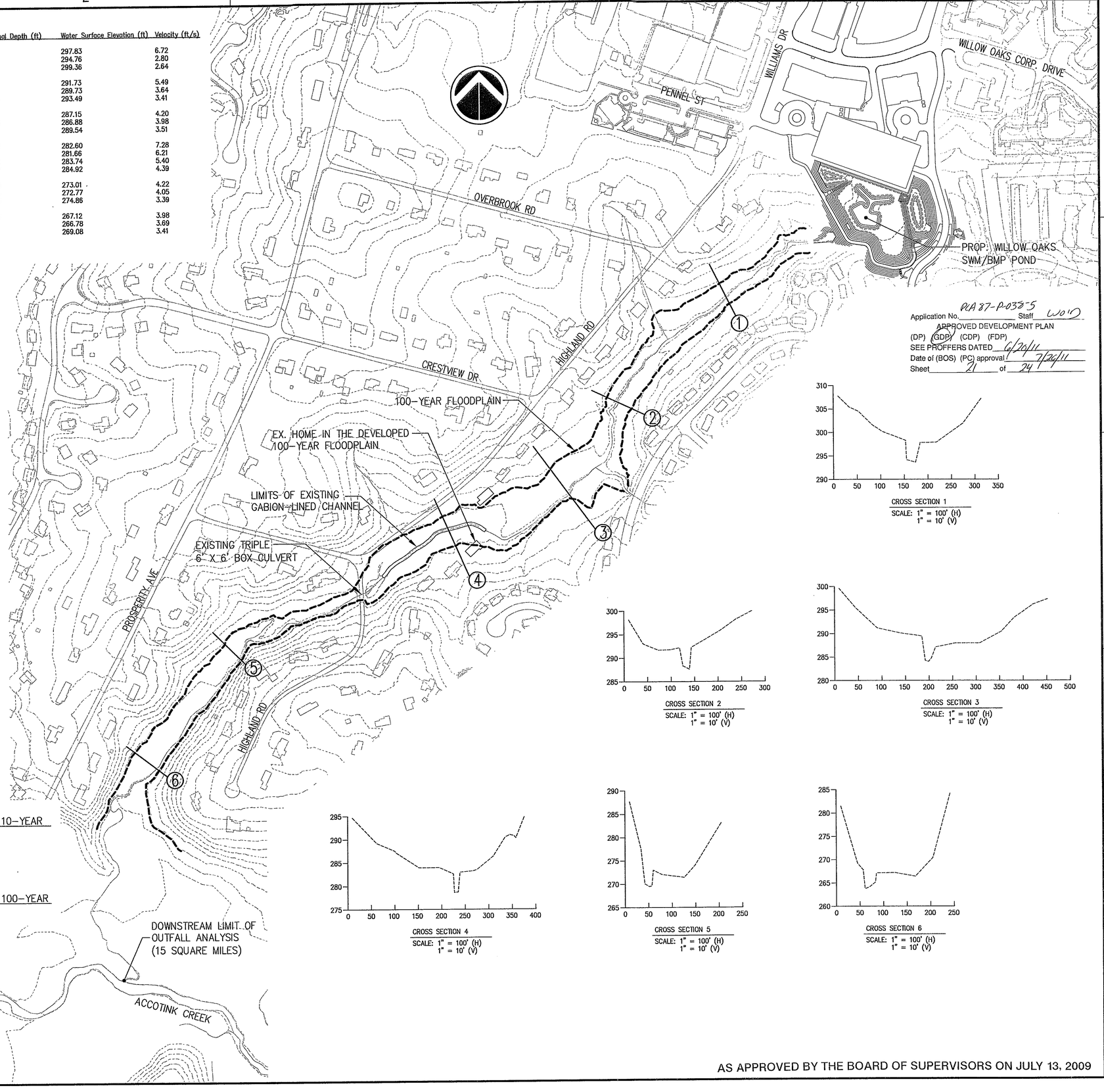
Roadway Profile Shape: Irregular Roadway Shape (coordinates)
Irregular Roadway Cross-Section:

Coord No.	Station (ft)	Elevation (ft)
1	0.00	295.61
2	7.00	294.56
3	45.00	290.31
4	84.00	286.22
5	124.00	283.64
6	164.00	282.51
7	203.00	282.78
8	240.00	283.85
9	277.00	285.06
10	287.00	285.52
11	321.00	287.63
12	357.00	290.10
13	394.00	293.12
14	429.00	296.75

Roadway Surface: Paved
Roadway Top Width: 15.00 ft

Culvert Summary Table: 3-6X6 BOX AT HIGHLAND LANE

Total Discharge (cfs)	Culvert Discharge (cfs)	Headwater Elevation (ft)	Inlet Control Depth (ft)	Outlet Control Depth (ft)	Flow Type	Normal Depth (ft)	Critical Depth (ft)	Outlet Depth (ft)	Tailwater Depth (ft)	Outlet Velocity (ft/s)	Tailwater Velocity (ft/s)	
0.00	0.00	274.71	0.000	0.000	0-NF	0.000	0.000	0.000	0.000	0.000	0.000	
116.50	116.50	276.60	1.624	1.893	1-S1t	0.959	1.094	1.608	1.798	3.580	3.066	
233.00	233.00	277.55	2.578	2.938	1-S1t	1.558	1.737	2.620	2.610	4.940	3.870	
349.50	349.50	278.50	3.404	3.793	1-S1t	2.091	2.276	3.251	3.241	5.973	4.409	
466.00	466.00	279.25	4.177	4.544	1-S1t	2.569	2.757	3.777	3.767	6.855	4.770	
564.00	564.00	279.83	4.790	5.121	1-S1t	2.953	3.131	4.160	4.150	7.532	4.924	10-YEAR
699.00	699.00	280.57	5.604	5.857	1-S1t	3.468	3.612	4.622	4.612	8.402	5.036	
815.50	815.50	281.16	6.301	6.454	5-S1t	3.924	4.003	4.974	4.964	9.109	5.091	
932.00	932.00	281.73	7.009	7.023	5-S1t	4.357	4.376	5.292	5.282	9.784	5.130	
1048.50	1048.50	282.45	7.745	7.571	7-M1t	4.783	4.733	5.582	5.572	10.435	5.163	
1165.00	1132.10	283.01	8.235	7.996	7-M1t	5.065	4.982	5.842	5.832	10.766	5.208	100-YEAR



CROSS SECTION 1
SCALE: 1" = 100' (H)
1" = 10' (V)

CROSS SECTION 2
SCALE: 1" = 100' (H)
1" = 10' (V)

CROSS SECTION 3
SCALE: 1" = 100' (H)
1" = 10' (V)

CROSS SECTION 4
SCALE: 1" = 100' (H)
1" = 10' (V)

CROSS SECTION 5
SCALE: 1" = 100' (H)
1" = 10' (V)

CROSS SECTION 6
SCALE: 1" = 100' (H)
1" = 10' (V)

AS APPROVED BY THE BOARD OF SUPERVISORS ON JULY 13, 2009

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Application No. RZA 87-P-033-5 Staff WOLD
APPROVED DEVELOPMENT PLAN
(DP) (GDP) (CDP) (FDP)
SEE PROFFERS DATED 6/20/11
Date of (BOS) (PC) approval 7/26/11
Sheet 21 of 24

INOVA
WILLOW OAKS

PARTIAL GENERALIZED DEVELOPMENT PLAN AMENDMENT
PROVIDENCE DISTRICT
FAIRFAX COUNTY, VIRGINIA

SEAL
COMMONWEALTH OF VIRGINIA
TIMOTHY CHARLES CULLETON
Lic. No. 20112
6.10.09
PROFESSIONAL ENGINEER

KEY PLAN
COMMONWEALTH OF VIRGINIA
EDWARD J. WALSH
Lic. No. 3,579
4/27/11

SCALE
0' 200' 400'

No.	DATE	BY	Description
10	06.10.09	ARW	
9	06.05.09	ARW	
8	05.20.09	ARW	
7	04.20.09	ARW	
6	03.26.09	ARW	
5	02.19.09	ARW	
4	01.23.09	ARW	
3	10.09.08	ARW	
2	08.28.08	ARW	
1	07.31.08	ARW	

REVISIONS

DRAWN BY JMC
APPROVED BY
CHECKED BY PGY
DATE April 14, 2008

TITLE
Inova
Willow Oaks
Partial Generalized Development Plan Amendment
Outfall Plan and Cross Sections

PROJECT NO.

17

SHEET NO. 17 OF 20

M-10690

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Watershed Description

Part 1: List all of the Subareas and "C" Factors used in the BMP Computaions

	Subarea Designation and Description (1)	"C" (2)	Acres (3)
Awo	DEVELOPED WATERSHED TO PROPOSED WILLOW OAKS SWM/BMP POND (GDPA)	0.72	130.10
Afh	UNCONTROLLED FAIRFAX HOSPITAL DEVELOPMENT (SEA)	0.85	27.17

Phosphorus Removal Calculations (Part 2 - 4)

Part 2: Compute the Weighted Average "C" Factor for the Site:

(A) Area of the site (a) 157.27 ac

	Subarea Designation and Description (1)	"C" (2)		Acres (3)		Product (4)
Awo	DEVELOPED WATERSHED TO PROPOSED WILLOW OAKS SWM/BMP POND (GDPA)	0.72	x	130.10	=	93.67
Afh	UNCONTROLLED FAIRFAX HOSPITAL DEVELOPMENT (SEA)	0.85	x	27.17	=	23.09
			(b)	Total	=	116.76

(C) Weigthed average "C" factor (b) / (a) = 0.74

Part 3: Compute the Total Phoshorus Removal for the Site

Subarea	BMP Type	Removal Eff (%)	"C"	Acres	Area Ratio	C-factor Ratio	Product (%)
Awo	SWM/BMP POND	50	0.72	130.10	0.827	0.973	40.23
Afh	NONE	0	0.85	27.17	0.173	1.149	0.00
				(a)	Total	=	40.23

Part 4: Determine Compliance with Phosphorus Removal

Select Requirement:

Water Supply Overlay District (Occoquan Watershed) = 50% (Fairfax County and Prince William County)

Chesapeake Bay Preservation Area (New Development) = 40% (Fairfax County) 50% (Prince William County)

Chesapeake Bay Preservation Area (Redevelopment) = [1-0.9x("I"pre/"I"post)]x100 = _____ %

Requirement (a) 40.00 %

If Line 3(a) 40.23 >=Line 4(a) 40.00 then Phosphorus removal requirement is satisfied

BMP Storage Calculations (Part 7 - 8)

Part 7: Compute the Weighted Average "C" Factor for the Proposed BMP Facility

	Subarea Designation and Description (1)	"C" (2)		Acres (3)		Product (4)
Awo	DEVELOPED WATERSHED TO PROPOSED WILLOW OAKS SWM/BMP POND (GDPA)	0.72	x	130.10	=	93.67
			(a)	130.10	(b)	93.67

(C) Weigthed average "C" factor (b) / (a)=(c) = 0.72

BMP Outlet Computations

Part 9: Determine the Required Orifice Size for the Proposed BMP Facility

(A) BMP storage requirement from Part 8. (a) 295978 cf

(B) Maximum head (h) at the required BMP storage from the Stage-Storage curve for the facility. (b) 3.5 ft

(C) Peak Outflow Rate (Qp) at the maximum head for a drawdown time of 48 hrs [Qp=S/(0.5x3600x48)]

0.0000116xLine 9(a) 295978 = (c) 3.4257 cfs

(D) Required Orifice Area (A) [A=Qp/(0.6x(64.4xh)$^{0.5}$]

Line 9(c) 3.4257 / [0.6x(64.4xLine 9(b) 3.5)$^{0.5}$] = (d) 0.3803 sf

(E) Diameter of a circular orifice

2.0 x (Line 9(d) 0.3803 /3.1415927)$^{0.5}$ = (e) 0.696 ft

8.352 in

USE 8.0 in

Part 8: Determine the Storage Required for the Proposed BMP Facility

C = 0.72 (weighted "C" for area draining to Pond)

Chart A6-40 value (Appendix 4-3) for BMP storage per acre:

(4375 x C) - 875 = 2275.0 cf/ac

Design 1 (48hr Drawdown)

Effective Drainage Area to Pond = 130.10 ac

Storage Volume Required = 295,978 cf

6.80 ac-ft

Storage Volume Provided = 483,952 cf - 181,863 cf = 302,089 cf

2.21 ac-ft

At Stage Elevation = 304.50 ft

WILLOW OAKS SWM/BMP POND STAGE STORAGE

Elev. (ft)	Acres	Volume (ac-ft) Incremental	Cummulative	
294.0	0.19	0.0000	0.0000	
295.0	0.28	0.2350	0.2350	
296.0	0.35	0.3150	0.5500	
298.0	0.53	0.8800	1.4300	
299.5	0.67	0.9000	2.3300	
300.5	1.43	1.0500	3.3800	
(Marsh WSE) 301.0	1.75	0.7950	4.1750	181,863 cf
302.0	1.88	1.8150	5.9900	
304.0	2.15	4.0300	10.0200	
(BMP WSE) 304.5	2.21	1.0900	11.1100	483,952 cf
306.0	2.33	3.4050	14.5150	
308.0	2.49	4.8200	19.3350	
310.0	2.6	5.0900	24.4250	
312.0	2.77	5.3700	29.7950	
314.0	2.95	5.7200	35.5150	
316.0	3.12	6.0700	41.5850	
316.5	3.16	1.5700	43.1550	

WILLOW OAKS SWM/BMP POND SPILLWAY RATING CURVE (UNCLOGGED CONDITION)

RISER ORIFICE FLOW					CULVERT RATING CURVE	
ORIFICE NO.	CENTROID ELEV.	AREA	C	DESCRIPTION	SIZE: DBL 10' X 8' RCBC	
					ELEV.	DISCHARGE
1	301.33	0.349	0.6	8" EXT'D DETENTION INV=301.00	299	0
2	305	4.5	0.6	4.5' X 1' ORIFICE INV=304.50	302.75	40
3 (top)	310.75	260	0.6	TOP OF 26' X 10' RISER	302.90	80
					303.04	120
RISER WEIR FLOW				EMER. SPILLWAY FLOW	303.16	160
WEIR NO.	CREST ELEV.	LENGTH	C		303.28	200
				CREST ELEV. =	304.13	500
1	307	2	3	WIDTH =	308.66	1500
2 (top)	310.75	44	3	Z =	311.48	2000
3 (headwall)	312.5	26	3	C =	317.46	2800

ELEV.	ORIFICES Q1	Q2	Q3	WEIRS Q1	Q2	Q3	RISER FLOW	CULVERT CAPACITY	Q P.S.W. (Control)	Q E.S.W.	TOTAL FLOW	COMMENTS
301	0.0	0.0	0.0	0.0	0.0	0.0	0.0	21.3	0.0	0.0	0.0	
302	1.4	0.0	0.0	0.0	0.0	0.0	1.4	32.0	1.4	0.0	1.4	
306	3.6	21.7	0.0	0.0	0.0	0.0	25.3	913.2	25.3	0.0	25.3	
308	4.3	37.5	0.0	6.0	0.0	0.0	47.9	1354.3	47.9	0.0	47.9	
310.75	5.2	52.0	0.0	43.6	0.0	0.0	100.7	1871.0	100.7	0.0	100.7	
312	5.5	57.3	1399.7	67.1	184.5	0.0	314.4	2070.0	314.4	0.0	314.4	
314	6.0	65.0	2256.9	111.1	773.4	143.3	1098.8	2337.4	1098.8	0.0	1098.8	
316	6.4	71.9	2868.4	162.0	1587.9	510.7	2338.9	2604.8	2338.9	0.0	2338.9	
316.5	6.5	73.5	3001.9	175.7	1820.0	624.0	2699.7	2671.6	2671.6	0.0	2671.6	culvert control

WILLOW OAKS SWM/BMP POND SPILLWAY RATING CURVE (CLOGGED CONDITION)

RISER ORIFICE FLOW					CULVERT RATING CURVE	
ORIFICE NO.	CENTROID ELEV.	AREA	C	DESCRIPTION	SIZE: DBL 10' X 8' RCBC	
					ELEV.	DISCHARGE
1	301.33	0	0.6	8" EXT'D DETENTION INV=301.00	299	0
2	305	0	0.6	4.5' X 1' ORIFICE INV=304.50	302.75	40
3 (top)	310.75	260	0.6	TOP OF 26' X 10' RISER	302.90	80
					303.04	120
RISER WEIR FLOW				EMER. SPILLWAY FLOW	303.16	160
WEIR NO.	CREST ELEV.	LENGTH	C		303.28	200
				CREST ELEV. =	304.13	500
1	307	0	3	WIDTH =	308.66	1500
2 (top)	310.75	44	3	Z =	311.48	2000
3 (headwall)	312.5	26	3	C =	317.46	2800

ELEV.	ORIFICES Q1	Q2	Q3	WEIRS Q1	Q2	Q3	RISER FLOW	CULVERT CAPACITY	Q P.S.W. (Control)	Q E.S.W.	TOTAL FLOW	COMMENTS
301	0.0	0.0	0.0	0.0	0.0	0.0	0.0	21.3	0.0	0.0	0.0	
302	0.0	0.0	0.0	0.0	0.0	0.0	0.0	32.0	0.0	0.0	0.0	
306	0.0	0.0	0.0	0.0	0.0	0.0	0.0	913.2	0.0	0.0	0.0	
308	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1354.3	0.0	0.0	0.0	
310.75	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1871.0	0.0	0.0	0.0	
312	0.0	0.0	1399.7	0.0	184.5	0.0	184.5	2070.0	184.5	0.0	184.5	
314	0.0	0.0	2256.9	0.0	773.4	143.3	916.7	2337.4	916.7	0.0	916.7	
316	0.0	0.0	2868.4	0.0	1587.9	510.7	2098.6	2604.8	2098.6	0.0	2098.6	
316.5	0.0	0.0	3001.9	0.0	1820.0	624.0	2444.0	2671.6	2444.0	0.0	2444.0	

EXISTING POND 'A' SPILLWAY RATING CURVE

ORIFICE FLOW					CULVERT RATING CURVE	
ORIFICE NO.	CENTROID ELEV.	AREA	C	DESCRIPTION	SIZE: 48" RCP	
					ELEV.	DISCHARGE
1	307.96	3.142	0.6	24" ORIFICE AT INV=306.96	306.96	0
2					310.59	30
3 (riser top)	316	28.274	0.6	6' DIA RISER AT TOP = 316.00	313.67	60
					314.90	90
WEIR FLOW				EMER. SPILLWAY FLOW	316.54	120
WEIR NO.	CREST ELEV.	LENGTH	C		316.57	150
				CREST ELEV. = 316.5	320.99	180
1				WIDTH = 170	323.78	210
2				Z =	326.97	240
3 (riser top)	316	18.85	3	C = 2.6		

ELEV.	ORIFICES Q1	Q2	Q3	WEIRS Q1	Q2	Q3	RISER FLOW	CULVERT CAPACITY	Q P.S.W. (Control)	Q E.S.W.	TOTAL FLOW	COMMENTS
306.96	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
309	15.4	0.0	0.0	0.0	0.0	0.0	15.4	16.8	15.4	0.0	15.4	
310	21.6	0.0	0.0	0.0	0.0	0.0	21.6	25.1	21.6	0.0	21.6	
312	30.4	0.0	0.0	0.0	0.0	0.0	30.4	43.7	30.4	0.0	30.4	
314	37.2	0.0	0.0	0.0	0.0	0.0	37.2	68.0	37.2	0.0	37.2	
316	42.9	0.0	0.0	0.0	0.0	0.0	42.9	110.1	42.9	0.0	42.9	
318	47.9	0.0	192.5	0.0	0.0	159.9	207.9	141.6	141.6	812.0	953.6	culvert control

EXISTING REGIONAL POND 'B' SPILLWAY RATING CURVE

ORIFICE FLOW					CULVERT RATING CURVE	
ORIFICE NO.	CENTROID ELEV.	AREA	C	DESCRIPTION	SIZE: 60" RCP	
					ELEV.	DISCHARGE
1	300.47	4.909	0.6	30" ORIFICE AT INV=299.22	299.22	0
2					303.52	100
3 (riser top)	311.02	19.635	0.6	5' DIA RISER AT TOP = 311.02	306.67	200
					311.83	300
WEIR FLOW				EMER. SPILLWAY FLOW	319.05	400
WEIR NO.	CREST ELEV.	LENGTH	C		328.58	500
				CREST ELEV. = 312.5	343.49	600
1				WIDTH = 95	372.54	700
2				Z =	432.86	800
3 (riser top)	311.02	15.708	3	C = 2.6	552.75	900

ELEV.	ORIFICES Q1	Q2	Q3	WEIRS Q1	Q2	Q3	RISER FLOW	CULVERT CAPACITY	Q P.S.W. (Control)	Q E.S.W.	TOTAL FLOW	COMMENTS
299.22	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
303	37.6	0.0	0.0	0.0	0.0	0.0	37.6	88.0	37.6	0.0	37.6	
304	44.4	0.0	0.0	0.0	0.0	0.0	44.4	115.3	44.4	0.0	44.4	
306	55.6	0.0	0.0	0.0	0.0	0.0	55.6	178.7	55.6	0.0	55.6	
308	64.9	0.0	0.0	0.0	0.0	0.0	64.9	225.8	64.9	0.0	64.9	
310	73.0	0.0	0.0	0.0	0.0	0.0	73.0	264.6	73.0	0.0	73.0	
312	80.3	0.0	93.6	0.0	0.0	45.7	126.0	302.4	126.0	0.0	126.0	
312.5	82.0	0.0	115.0	0.0	0.0	84.8	166.8	309.3	166.8	0.0	166.8	
314	86.9	0.0	163.2	0.0	0.0	242.4	250.1	330.1	250.1	453.8	703.9	riser orifice control
315	90.1	0.0	188.6	0.0	0.0	374.2	278.7	343.9	278.7	976.4	1255.1	riser orifice control

EXISTING POND 'A' STAGE STORAGE

Elev. (ft)	Acres	Volume (ac-ft) Incremental	Cummulative
306.96	0	0.0000	0.0000
308.0	0.03	0.0156	0.0156
310.0	0.46	0.4900	0.5056
312.0	0.58	1.0400	1.5456
314.0	0.69	1.2700	2.8156
316.0	0.81	1.5000	4.3156
318.0	0.81	1.6200	5.9356

EXISTING REGIONAL POND 'B' STAGE STORAGE

Elev. (ft)	Acres	Volume (ac-ft) Incremental	Cummulative
299.22	0	0.0000	0.0000
302.0	0.03	0.0417	0.0417
304.0	0.13	0.1600	0.2017
306.0	0.63	0.7600	0.9617
308.0	0.83	1.4600	2.4217
310.0	1.31	2.1400	4.5617
312.0	1.82	3.1300	7.6917
314.0	2.44	4.2600	11.9517
315.0	2.44	2.4400	14.3917

Application No. PLA 87-P-038-5 Staff WO'D

APPROVED DEVELOPMENT PLAN

(DP) (GDP) (CDP) (FDP)

SEE PROFFERS DATED 6/29/11

Date of (BOS) (PC) approval 7/26/11

Sheet 22 of 24

AS APPROVED BY THE BOARD OF SUPERVISORS ON JULY 13, 2009

Q:\PROJECT\INOVA\Willow Oaks\Submissions\Development Plan\Deliverables\18-SWM-BMP.dwg, 6/10/2009 1:07:03 PM, 1055CM-Planning.pc3

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INOVA
WILLOW OAKS

PARTIAL GENERALIZED DEVELOPMENT PLAN AMENDMENT
PROVIDENCE DISTRICT
FAIRFAX COUNTY, VIRGINIA

SEAL

COMMONWEALTH OF VIRGINIA
TIMOTHY CHARLES CULLETON
Lic. No. 20112
6-10-09
PROFESSIONAL ENGINEER

KEY PLAN

COMMONWEALTH OF VIRGINIA
EDMUND J. IGNACIO
Lic. No. 33579
4/27/11
PROFESSIONAL ENGINEER

SCALE

No.	DATE	BY	Description
10	06.10.09	ARW	
9	06.05.09	ARW	
8	05.20.09	ARW	
7	04.20.09	ARW	
6	03.26.09	ARW	
5	02.19.09	ARW	
4	01.23.09	ARW	
3	10.09.08	ARW	
2	08.28.08	ARW	
1	07.31.08	ARW	

REVISIONS

DRAWN BY JMC

APPROVED BY

CHECKED BY PGY

DATE April 14, 2008

TITLE

Inova
Willow Oaks

Partial Generalized Development
BMP Computations and
Rating Curves

PROJECT NO.

18

SHEET NO. 18 OF 20

M-10690

```
X     X  XXXXXXX   XXXXX          X
X     X  X        X     X        XX
X     X  X        X               X
XXXXXXX  XXXX     X       XXXXX   X
X     X  X        X               X
X     X  X        X     X         X
X     X  XXXXXXX   XXXXX         XXX
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THIS PROGRAM REPLACES ALL PREVIOUS VERSIONS OF HEC-1 KNOWN AS HEC1 (JAN 73), HEC1GS, HEC1DB, AND HEC1KW.

THE DEFINITIONS OF VARIABLES -RTIMP- AND -RTIOR- HAVE CHANGED FROM THOSE USED WITH THE 1973-STYLE INPUT STRUCTURE.
THE DEFINITION OF -AMSKK- ON RM-CARD WAS CHANGED WITH REVISIONS DATED 28 SEP 81. THIS IS THE FORTRAN77 VERSION
NEW OPTIONS: DAMBREAK OUTFLOW SUBMERGENCE , SINGLE EVENT DAMAGE CALCULATION, DSS:WRITE STAGE FREQUENCY,
DSS:READ TIME SERIES AT DESIRED CALCULATION INTERVAL   LOSS RATE:GREEN AND AMPT INFILTRATION
KINEMATIC WAVE: NEW FINITE DIFFERENCE ALGORITHM

1                                        HEC-1 INPUT                                              PAGE  1

LINE          ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10

  1           ID        WILLOW OAKS PROPOSED BMP/SWM POND AND OUTFALL
  2           ID        FAIRFAX COUNTY, VIRGINIA
  3           ID        SCS TYPE II, 24-HOUR RAINFALL DISTRIBUTION
  4           ID        FAIRFAX COUNTY PFM RAINFALL DEPTHS
  5           ID        EXISTING CONDITIONS DEVELOPMENT
              *DIAGRAM
  6           IT      5                 300
  7           IO      5
              *          2-YR     10-YR    100-YR  OVERTOP
  8           JR    PREC    3.2       5.2      7.3     3.3
              *

  9           KK     1-A
 10           KM  BASIN 1-A RUNOFF HYDROGRAPH TO EX POND A
 11           BA   0.058
 12           PB      1
              * SCS TypeII Rainfall Distribution Pattern
 13           IN      6
 14           PC     0.0  .00101  .00202  .00305  .00408  .00513  .00618  .00725  .00832  .00941
 15           PC  .01050  .01161  .01272  .01385  .01498  .01613  .01728  .01845  .01962  .02081
 16           PC    .022  .02321  .02442  .02565  .02688  .02813  .02938  .03065  .03192  .03321
 17           PC  .03450  .03581  .03712  .03845  .03978  .04113  .04248  .04385  .04522  .04661
 18           PC    .048  .04941  .05084  .05229  .05376  .05525  .05676  .05829  .05984  .06141
 19           PC    .063  .06461  .06624  .06789  .06956  .07125  .07296  .07469  .07644  .07821
 20           PC     .08  .08181  .08364  .08549  .08736  .08925  .09116  .09309  .09504  .09701
 21           PC    .099  .10101  .10304  .10509  .10716  .10925  .11136  .11349  .11564  .11781
 22           PC     .12  .12225  .12460  .12705  .12960  .13225    .135  .13785  .14080  .14385
 23           PC    .147   .1502  .15340   .1566   .1598    .163  .16628  .16972  .17332  .17708
 24           PC    .181  .18512  .18948  .19408  .19892    .204   .2094   .2152   .2214    .228
 25           PC    .235  .24268  .25132  .26092  .27148    .283  .30684  .35436  .43079  .56786
 26           PC    .663  .68196  .69864  .71304  .72516    .735  .74344  .75136  .75876  .76564
 27           PC    .772  .77796  .78364  .78904  .79416    .799   .8036    .808   .8122   .8162
 28           PC     .82  .82367  .82726  .83079  .83424  .83763  .84094  .84419  .84736  .85047
 29           PC  .85350  .85647  .85936  .86219  .86494  .86763  .87024  .87279  .87526  .87767
 30           PC     .88  .88229  .88455  .88679    .889  .89119  .89335  .89549   .8976  .89969
 31           PC  .90175  .90379   .9058  .90779  .90975  .91169   .9136  .91549  .91735  .91919
 32           PC    .921  .92279  .92455  .92629    .928  .92969  .93135  .93299   .9346  .93619
 33           PC  .93775  .93929   .9408  .94229  .94375  .94519   .9466  .94799  .94935  .95069
 34           PC    .952   .9533  .95459  .95588  .95716  .95844  .95971  .96098  .96224   .9635
 35           PC  .96475    .966  .96724  .96848  .96971  .97094  .97216  .97338  .97459   .9758
 36           PC    .977   .9782  .97939  .98058  .98176  .98294  .98411  .98528  .98644  .98760
 37           PC  .98875   .9899  .99104  .99218  .99331  .99444  .99556  .99668  .99779   .9989
 38           PC     1.0
 39           LS              84
 40           UD     0.1
              *

 41           KK      PA
 42           KM  ROUTE THROUGH EXISTING POND A
 43           RS       1    ELEV  306.96
 44           SA       0    0.03    0.46    0.58    0.69    0.81    0.81
 45           SE  306.96     308     310     312     314     316     318
 46           SQ       0    15.4    21.6    30.4    37.2    42.9   953.6
 47           SE  306.96     309     310     312     314     316     318
              *
1                                        HEC-1 INPUT                                              PAGE  2

LINE          ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10

 48           KK     1-B
 49           KM  BASIN 1-B RUNOFF HYDROGRAPH TO EX POND B
 50           BA   0.145
 51           LS              87
 52           UD     0.1
              *

 53           KK    TO B
 54           KM  COMBINE PA HYDROGRAPH TO BASIN 1-B HYDROGRAPH
 55           HC       2
              *

 56           KK      PB
 57           KM  ROUTE "TO B" HYDROGRAPH THROUGH EXISTING REGIONAL POND B
 58           RS       1    ELEV  299.22
 59           SA       0    0.03    0.13    0.63    0.83    1.31    1.82    2.44    2.44
 60           SE  299.22     302     304     306     308     310     312     314     315
 61           SQ       0    37.6    44.4    55.6    64.9      73     126   166.8   703.9  1255.1
 62           SE  299.22     303     304     306     308     310     312   312.5     314     315
              *

 63           KK       2
 64           KM  BASIN 2 EXISTING RUNOFF HYDROGRAPH
 65           BA   0.034
 66           LS              75
 67           UD    0.10
              *

 68           KK  FLOW-1
 69           KM  COMBINE BASIN 2 HYDROGRAPH TO PB HYDROGRAPH
 70           HC       2
              *

 71           KK       5
 72           KM  BASIN 5 EXISTING RUNOFF HYDROGRAPH
 73           BA   0.058
 74           LS              77
 75           UD    0.15
              *

 76           KK  FLOW-2
 77           KM  COMBINE BASIN 5 HYDROGRAPH TO FLOW-1 HYDROGRAPH
 78           HC       2
              *

 79           KK       3
 80           KM  BASIN 3 EXISTING RUNOFF HYDROGRAPH
 81           BA    0.08
 82           LS              82
 83           UD    0.10
              *
1                                        HEC-1 INPUT                                              PAGE  3

LINE          ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10

 84           KK  X-POND
 85           KM  ROUTE BASIN 3 EXISTING RUNOFF HYDROGRAPH THROUGH EX POND AT MONARCH RD
 86           RS       1    ELEV     290
 87           SA       0    0.22    0.24    0.56     1.8
 88           SE     290     292     295     300     305
 89           SQ       0     9.3    14.1    17.7   134.7   329.1   368.4  1197.7
 90           SE     290     292     294     296     298     300     302     304
              *

 91           KK       4
 92           KM  BASIN 4 EXISTING RUNOFF HYDROGRAPH
 93           BA   0.016
 94           LS              73
 95           UD    0.10
              *

 96           KK   COMB1
 97           KM  COMBINE X-POND HYDROGRAPH TO BASIN 4 HYDROGRAPH
 98           HC       2
              *

 99           KK   COMB2
100           KM  COMBINE FLOW-2 HYDROGRAPH TO COMB1 HYDROGRAPH
101           HC       2
              *

102           KK    CR-1
103           KM  CHANNEL ROUTE COMB2 HYDROGRAPH TO FLOW-3 NODE
104           RD
105           RC     0.1   0.045     0.1     600  0.0065
106           RX       0     129     175     182     189     203     344     443
107           RY  299.58  290.12  289.47  284.27  284.77  287.15  290.44  297.29
              *

108           KK     6-A
109           KM  BASIN 6-A EXISTING RUNOFF HYDROGRAPH
110           BA   0.027
111           LS              77
112           UD     0.1
              *

113           KK  FLOW-3
114           KM  COMBINE BASIN 6-A HYDROGRAPH TO CR-1 HYDROGRAPH
115           HC       2
              *

116           KK    CR-2
117           KM  CHANNEL ROUTE FLOW 3 HYDROGRAPH TO FLOW-4 NODE
118           RD
119           RC     0.1   0.045     0.1     435  0.0104
120           RX       0     142     215     217     225     229     266  366.07
121           RY   294.7  283.95   282.6  278.65  278.73     283  283.59  294.78
              *
1                                        HEC-1 INPUT                                              PAGE  4

LINE          ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10

122           KK     6-B
123           KM  BASIN 6-B EXISTING RUNOFF HYDROGRAPH
124           BA   0.053
125           LS              71
126           UD    0.15
              *

127           KK  FLOW-4
128           KM  COMBINE BASIN 6-B HYDROGRAPH TO CR-2 HYDROGRAPH
129           HC       2
              *

130           KK    CR-3
131           KM  CHANNEL ROUTE FLOW-4 HYDROGRAPH TO FLOW-5 NODE
132           RD
133           RC     0.1  0.0575     0.1    2550   0.008
134           RX       0      32      66      75      85      89     161   220.2
135           RY  285.54  278.13  272.61  265.49  266.48  268.98  272.76   286.5
              *

136           KK       7
137           KM  BASIN 7 EXISTING RUNOFF HYDROGRAPH
138           BA   0.048
139           LS              73
140           UD     0.1
              *

141           KK  FLOW-5
142           KM  COMBINE BASIN 7 HYDROGRAPH TO CR-3 HYDROGRAPH
143           HC       2
              *
144           ZZ
```

```
1
              SCHEMATIC DIAGRAM OF STREAM NETWORK
INPUT
 LINE     (V) ROUTING           (--->) DIVERSION OR PUMP FLOW

  NO.     (.) CONNECTOR         (<---) RETURN OF DIVERTED OR PUMPED FLOW

   9         1-A
              V
              V
  41         PA
              .
              .
  48          .          1-B
              .            .
              .            .
  53       TO B............
              V
              V
  56         PB
              .
              .
  63          .            2
              .            .
              .            .
  68     FLOW-1............
              .
              .
  71          .            5
              .            .
              .            .
  76     FLOW-2............
              .
              .
  79          .            3
              .            V
              .            V
  84          .        X-POND
              .            .
              .            .
  91          .            .          4
              .            .          .
              .            .          .
  96          .        COMB1...........
              .            .
              .            .
  99      COMB2............
              V
              V
 102       CR-1
              .
              .
 108          .          6-A
              .            .
              .            .
 113     FLOW-3............
              V
              V
 116       CR-2
              .
              .
 122          .          6-B
              .            .
              .            .
 127     FLOW-4............
              V
              V
 130       CR-3
              .
              .
 136          .            7
              .            .
              .            .
 141     FLOW-5............
```

```
        PEAK FLOW AND STAGE (END-OF-PERIOD) SUMMARY FOR MULTIPLE PLAN-RATIO ECONOMIC COMPUTATIONS
                         FLOWS IN CUBIC FEET PER SECOND,  AREA IN SQUARE MILES
                                       TIME TO PEAK IN HOURS

                                                        RATIOS APPLIED TO PRECIPITATION
OPERATION       STATION     AREA   PLAN            RATIO 1   RATIO 2   RATIO 3   RATIO 4
                                                      3.20      5.20      7.30      3.30

HYDROGRAPH AT
+                  1-A       .06     1   FLOW       81.      163.      250.       85.
                                         TIME     12.00     12.00     12.00     12.00

ROUTED TO
+                   PA       .06     1   FLOW       29.       40.      170.       29.
                                         TIME     12.25     12.25     12.08     12.25

                                     ** PEAK STAGES IN FEET **
                                     1   STAGE    311.59    314.83    316.28    311.77
                                         TIME     12.25     12.25     12.08     12.25

HYDROGRAPH AT
+                  1-B       .14     1   FLOW      229.      436.      654.      239.
                                         TIME     12.00     12.00     12.00     12.00

 2 COMBINED AT
+                 TO B       .20     1   FLOW      253.      470.      695.      264.
                                         TIME     12.00     12.00     12.00     12.00

ROUTED TO
+                   PB       .20     1   FLOW       77.      246.      594.       81.
                                         TIME     12.33     12.17     12.08     12.33

                                     ** PEAK STAGES IN FEET **
                                     1   STAGE    310.16    312.72    313.69    310.32
                                         TIME     12.33     12.17     12.08     12.33

HYDROGRAPH AT
+                    2       .03     1   FLOW       30.       74.      123.       32.
                                         TIME     12.00     12.00     12.00     12.00

 2 COMBINED AT
+               FLOW-1       .24     1   FLOW       96.      278.      689.       99.
                                         TIME     12.00     12.17     12.08     12.00

HYDROGRAPH AT
+                    5       .06     1   FLOW       50.      115.      190.       53.
                                         TIME     12.08     12.08     12.00     12.08

 2 COMBINED AT
+               FLOW-2       .29     1   FLOW      145.      362.      877.      150.
                                         TIME     12.08     12.17     12.08     12.08

HYDROGRAPH AT
+                    3       .08     1   FLOW      102.      214.      334.      107.
                                         TIME     12.00     12.00     12.00     12.00

ROUTED TO
+               X-POND       .08     1   FLOW       76.      187.      294.       82.
                                         TIME     12.08     12.08     12.08     12.08

                                     ** PEAK STAGES IN FEET **
                                     1   STAGE    297.00    298.54    299.64    297.10
                                         TIME     12.08     12.08     12.08     12.08

HYDROGRAPH AT
+                    4       .02     1   FLOW       13.       32.       55.       13.
                                         TIME     12.00     12.00     12.00     12.00

 2 COMBINED AT
+                COMB1       .10     1   FLOW       86.      213.      349.       93.
                                         TIME     12.08     12.08     12.00     12.08

 2 COMBINED AT
+                COMB2       .39     1   FLOW      231.      545.     1213.      243.
                                         TIME     12.08     12.08     12.08     12.08

ROUTED TO
+                 CR-1       .39     1   FLOW      212.      528.     1094.      227.
                                         TIME     12.08     12.17     12.17     12.08

HYDROGRAPH AT
+                  6-A       .03     1   FLOW       27.       62.      102.       28.
                                         TIME     12.00     12.00     12.00     12.00

 2 COMBINED AT
+               FLOW-3       .42     1   FLOW      234.      568.     1165.      250.
                                         TIME     12.08     12.08     12.08     12.08

ROUTED TO
+                 CR-2       .42     1   FLOW      226.      560.     1146.      241.
                                         TIME     12.17     12.17     12.17     12.08

HYDROGRAPH AT
+                  6-B       .05     1   FLOW       32.       86.      150.       34.
                                         TIME     12.08     12.08     12.08     12.08

 2 COMBINED AT
+               FLOW-4       .47     1   FLOW      257.      624.     1255.      275.
                                         TIME     12.08     12.17     12.17     12.08

ROUTED TO
+                 CR-3       .47     1   FLOW      251.      607.     1196.      269.
                                         TIME     12.25     12.33     12.33     12.25

HYDROGRAPH AT
+                    7       .05     1   FLOW       38.       97.      166.       40.
                                         TIME     12.00     12.00     12.00     12.00

 2 COMBINED AT
+               FLOW-5       .52     1   FLOW      263.      628.     1230.      282.
                                         TIME     12.25     12.33     12.33     12.25
1

*** NORMAL END OF HEC-1 ***
```

Application No. PCA 87-P-038-5 Staff WOD
APPROVED DEVELOPMENT PLAN
(DP) (GDP) (CDP) (FDP)
SEE PROFFERS DATED 6/20/11
Date of (BOS) (PC) approval 7/26/11
Sheet 23 of 24

```
X     X  XXXXXXX   XXXXX          X
X     X  X        X     X        XX
X     X  X        X               X
XXXXXXX  XXXX     X       XXXXX   X
X     X  X        X               X
X     X  X        X     X         X
X     X  XXXXXXX   XXXXX         XXX
```

```
THIS PROGRAM REPLACES ALL PREVIOUS VERSIONS OF HEC-1 KNOWN AS HEC1 (JAN 73), HEC1GS, HEC1DB, AND HEC1KW.

THE DEFINITIONS OF VARIABLES -RTIMP- AND -RTIOR- HAVE CHANGED FROM THOSE USED WITH THE 1973-STYLE INPUT STRUCTURE.
THE DEFINITION OF -AMSKK- ON RM-CARD WAS CHANGED WITH REVISIONS DATED 28 SEP 81. THIS IS THE FORTRAN77 VERSION
NEW OPTIONS: DAMBREAK OUTFLOW SUBMERGENCE , SINGLE EVENT DAMAGE CALCULATION, DSS:WRITE STAGE FREQUENCY,
DSS:READ TIME SERIES AT DESIRED CALCULATION INTERVAL   LOSS RATE:GREEN AND AMPT INFILTRATION
KINEMATIC WAVE: NEW FINITE DIFFERENCE ALGORITHM

1                                        HEC-1 INPUT                                              PAGE  1

LINE          ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10

  1           ID        WILLOW OAKS PROPOSED BMP/SWM POND AND OUTFALL
  2           ID        FAIRFAX COUNTY, VIRGINIA
  3           ID        SCS TYPE II, 24-HOUR RAINFALL DISTRIBUTION
  4           ID        FAIRFAX COUNTY PFM RAINFALL DEPTHS
  5           ID        2-YR AND 10-YR STORMS
  6           ID        FORESTED WATERSHED CONDITION
              *DIAGRAM
  7           IT      5                 300
  8           IO      5
              *          2-YR     10-YR
  9           JR    PREC    3.2       5.2
              *

 10           KK      1
 11           KM  BASIN 1 RUNOFF HYDROGRAPH - ASSUME 130.1 ACRE WATERSHED IS COMPLETELY FORESTED
 12           BA   0.203
 13           PB      1
              * SCS TypeII Rainfall Distribution Pattern
 14           IN      6
 15           PC     0.0  .00101  .00202  .00305  .00408  .00513  .00618  .00725  .00832  .00941
 16           PC  .01050  .01161  .01272  .01385  .01498  .01613  .01728  .01845  .01962  .02081
 17           PC    .022  .02321  .02442  .02565  .02688  .02813  .02938  .03065  .03192  .03321
 18           PC  .03450  .03581  .03712  .03845  .03978  .04113  .04248  .04385  .04522  .04661
 19           PC    .048  .04941  .05084  .05229  .05376  .05525  .05676  .05829  .05984  .06141
 20           PC    .063  .06461  .06624  .06789  .06956  .07125  .07296  .07469  .07644  .07821
 21           PC     .08  .08181  .08364  .08549  .08736  .08925  .09116  .09309  .09504  .09701
 22           PC    .099  .10101  .10304  .10509  .10716  .10925  .11136  .11349  .11564  .11781
 23           PC     .12  .12225  .12460  .12705  .12960  .13225    .135  .13785  .14080  .14385
 24           PC    .147   .1502  .15340   .1566   .1598    .163  .16628  .16972  .17332  .17708
 25           PC    .181  .18512  .18948  .19408  .19892    .204   .2094   .2152   .2214    .228
 26           PC    .235  .24268  .25132  .26092  .27148    .283  .30684  .35436  .43079  .56786
 27           PC    .663  .68196  .69864  .71304  .72516    .735  .74344  .75136  .75876  .76564
 28           PC    .772  .77796  .78364  .78904  .79416    .799   .8036    .808   .8122   .8162
 29           PC     .82  .82367  .82726  .83079  .83424  .83763  .84094  .84419  .84736  .85047
 30           PC  .85350  .85647  .85936  .86219  .86494  .86763  .87024  .87279  .87526  .87767
 31           PC     .88  .88229  .88455  .88679    .889  .89119  .89335  .89549   .8976  .89969
 32           PC  .90175  .90379   .9058  .90779  .90975  .91169   .9136  .91549  .91735  .91919
 33           PC    .921  .92279  .92455  .92629    .928  .92969  .93135  .93299   .9346  .93619
 34           PC  .93775  .93929   .9408  .94229  .94375  .94519   .9466  .94799  .94935  .95069
 35           PC    .952   .9533  .95459  .95588  .95716  .95844  .95971  .96098  .96224   .9635
 36           PC  .96475    .966  .96724  .96848  .96971  .97094  .97216  .97338  .97459   .9758
 37           PC    .977   .9782  .97939  .98058  .98176  .98294  .98411  .98528  .98644  .98760
 38           PC  .98875   .9899  .99104  .99218  .99331  .99444  .99556  .99668  .99779   .9989
 39           PC     1.0
 40           LS              62
 41           UD    0.25
              *
 42           ZZ
        PEAK FLOW AND STAGE (END-OF-PERIOD) SUMMARY FOR MULTIPLE PLAN-RATIO ECONOMIC COMPUTATIONS
                         FLOWS IN CUBIC FEET PER SECOND,  AREA IN SQUARE MILES
                                       TIME TO PEAK IN HOURS

                                                        RATIOS APPLIED TO PRECIPITATION
OPERATION       STATION     AREA   PLAN            RATIO 1   RATIO 2
                                                      3.20      5.20

HYDROGRAPH AT
+                    1       .20     1   FLOW       39.      173.
                                         TIME     12.17     12.17

*** NORMAL END OF HEC-1 ***
```

AS APPROVED BY THE BOARD OF SUPERVISORS ON JULY 13, 2009

Dewberry®

Dewberry & Davis LLC
8403 ARLINGTON BLVD.
FAIRFAX, VA 22031
PHONE: 703.849.0100
FAX: 703.849.0519
www.dewberry.com

INOVA
WILLOW OAKS

PARTIAL GENERALIZED
DEVELOPMENT PLAN AMENDMENT

PROVIDENCE DISTRICT
FAIRFAX COUNTY, VIRGINIA

SEAL
COMMONWEALTH OF VIRGINIA
TIMOTHY CHARLES CULLEITON
Lic. No. 20112
6-10-09
PROFESSIONAL ENGINEER

KEY PLAN
COMMONWEALTH OF VIRGINIA
EDMUND J. IGNACIO
Lic. No. 33579
4/27/11
PROFESSIONAL ENGINEER

SCALE

No.	DATE	BY	Description
10	06.10.09	ARW	
9	06.05.09	ARW	
8	05.20.09	ARW	
7	04.20.09	ARW	
6	03.26.09	ARW	
5	02.19.09	ARW	
4	01.23.09	ARW	
3	10.09.08	ARW	
2	08.28.08	ARW	
1	07.31.08	ARW	

REVISIONS

DRAWN BY JMC
APPROVED BY
CHECKED BY PGY
DATE April 14, 2008

TITLE
Inova
Willow Oaks
Partial Generalized Development
Plan Amendment
HEC-1 Models

PROJECT NO.

19

SHEET NO. 19 OF 20
M-10690

```
X     X  XXXXXXX   XXXXX          X
X     X  X        X     X        XX
X     X  X        X               X
XXXXXXX  XXXX     X        XXXXX  X
X     X  X        X               X
X     X  X        X     X         X
X     X  XXXXXXX   XXXXX         XXX

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DSS:READ TIME SERIES AT DESIRED CALCULATION INTERVAL   LOSS RATE:GREEN AND AMPT INFILTRATION
KINEMATIC WAVE: NEW FINITE DIFFERENCE ALGORITHM

                                   HEC-1 INPUT                                         PAGE  1
1
LINE         ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10

  1          ID        WILLOW OAKS PROPOSED BMP/SWM POND AND OUTFALL
  2          ID        FAIRFAX COUNTY, VIRGINIA
  3          ID        SCS TYPE II, 24-HOUR RAINFALL DISTRIBUTION
  4          ID        FAIRFAX COUNTY PFM RAINFALL DEPTHS
  5          ID        ULTIMATE CONDITIONS DEVELOPMENT
             *DIAGRAM
  6          IT      5                   300
  7          IO      5
             *           2-YR      10-YR     100-YR    OVERTOP
  8          JR   PREC      3.2       5.2       7.3       3.3
             *

  9          KK      1
 10          KM  BASIN 1 RUNOFF HYDROGRAPH - ASSUME DEVELOPED SITE AREA IS BUILT OUT
 11          BA  0.203
 12          PB      1
             * SCS TypeII Rainfall Distribution Pattern
 13          IN      6
 14          PC     0.0  .00101  .00202  .00305  .00408  .00513  .00618  .00725  .00832  .00941
 15          PC  .01050  .01161  .01272  .01385  .01498  .01613  .01728  .01845  .01962  .02081
 16          PC    .022  .02321  .02442  .02565  .02688  .02813  .02938  .03065  .03192  .03321
 17          PC  .03450  .03581  .03712  .03845  .03978  .04113  .04248  .04385  .04522  .04661
 18          PC    .048  .04941  .05084  .05229  .05376  .05525  .05676  .05829  .05984  .06141
 19          PC    .063  .06461  .06624  .06789  .06956  .07125  .07296  .07469  .07644  .07821
 20          PC     .08  .08181  .08364  .08549  .08736  .08925  .09116  .09309  .09504  .09701
 21          PC    .099  .10101  .10304  .10509  .10716  .10925  .11136  .11349  .11564  .11781
 22          PC     .12  .12225  .12460  .12705  .12960  .13225    .135  .13785  .14080  .14385
 23          PC    .147   .1502  .15340   .1566   .1598    .163  .16628  .16972  .17332  .17708
 24          PC    .181  .18512  .18948  .19408  .19892    .204   .2094   .2152   .2214    .228
 25          PC    .235  .24268  .25132  .26092  .27148    .283  .30684  .35436  .43079  .56786
 26          PC    .663  .68196  .69864  .71304  .72516    .735  .74344  .75136  .75876  .76564
 27          PC    .772  .77796  .78364  .78904  .79416    .799   .8036    .808   .8122   .8162
 28          PC     .82  .82367  .82726  .83079  .83424  .83763  .84094  .84419  .84736  .85047
 29          PC  .85350  .85647  .85936  .86219  .86494  .86763  .87024  .87279  .87526  .87767
 30          PC     .88  .88229  .88455  .88679    .889  .89119  .89335  .89549   .8976  .89969
 31          PC  .90175  .90379   .9058  .90779  .90975  .91169   .9136  .91549  .91735  .91919
 32          PC    .921  .92279  .92455  .92629    .928  .92969  .93135  .93299   .9346  .93619
 33          PC  .93775  .93929   .9408  .94229  .94375  .94519   .9466  .94799  .94935  .95069
 34          PC    .952   .9533  .95459  .95588  .95716  .95844  .95971  .96098  .96224   .9635
 35          PC  .96475    .966  .96724  .96848  .96971  .97094  .97216  .97338  .97459   .9758
 36          PC    .977   .9782  .97939  .98058  .98176  .98294  .98411  .98528  .98644  .98760
 37          PC  .98875   .9899  .99104  .99218  .99331  .99444  .99556  .99668  .99779   .9989
 38          PC     1.0
 39          LS              89
 40          UD     0.1
             *

 41          KK    POND
 42          KM  ROUTE BASIN 1 ULTIMATE RUNOFF HYDROGRAPH THROUGH PROPOSED SWM POND
 43          RS       1    ELEV     301
 44          SA    1.75    1.88    2.15    2.33    2.49     2.6    2.77    2.95    3.12    3.16
 45          SE     301     302     304     306     308     310     312     314     316   316.5
 46          SQ       0     1.4    25.3    47.9   100.7   314.4  1098.8  2338.9  2671.6
 47          SE     301     302     306     308  310.75     312     314     316   316.5
             *
                                   HEC-1 INPUT                                         PAGE  2
1
LINE         ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10

 48          KK      2
 49          KM  BASIN 2 EXISTING RUNOFF HYDROGRAPH
 50          BA  0.034
 51          LS              75
 52          UD    0.10
             *

 53          KK  FLOW-1
 54          KM  COMBINE BASIN 2 HYDROGRAPH TO POND HYDROGRAPH
 55          HC      2
             *

 56          KK      5
 57          KM  BASIN 5 EXISTING RUNOFF HYDROGRAPH
 58          BA  0.058
 59          LS              77
 60          UD    0.15
             *

 61          KK  FLOW-2
 62          KM  COMBINE BASIN 5 HYDROGRAPH TO FLOW-1 HYDROGRAPH
 63          HC      2
             *

 64          KK      3
 65          KM  BASIN 3 EXISTING RUNOFF HYDROGRAPH
 66          BA    0.08
 67          LS              82
 68          UD    0.10
             *

 69          KK  X-POND
 70          KM  ROUTE BASIN 3 EXISTING RUNOFF HYDROGRAPH THROUGH EX POND AT MONARCH RD
 71          RS       1    ELEV     290
 72          SA       0    0.22    0.24    0.56     1.8
 73          SE     290     292     295     300     305
 74          SQ       0     9.3    14.1    17.7   134.7   329.1   368.4  1197.7
 75          SE     290     292     294     296     298     300     302     304
             *

 76          KK      4
 77          KM  BASIN 4 EXISTING RUNOFF HYDROGRAPH
 78          BA  0.016
 79          LS              73
 80          UD    0.10
             *

 81          KK   COMB1
 82          KM  COMBINE X-POND HYDROGRAPH TO BASIN 4 HYDROGRAPH
 83          HC      2
             *
                                   HEC-1 INPUT                                         PAGE  3
1
LINE         ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10

 84          KK   COMB2
 85          KM  COMBINE FLOW-2 HYDROGRAPH TO COMB1 HYDROGRAPH
 86          HC      2
             *

 87          KK    CR-1
 88          KM  CHANNEL ROUTE COMB2 HYDROGRAPH TO FLOW-3 NODE
 89          RD
 90          RC     0.1   0.045     0.1     600  0.0065
 91          RX       0     129     175     182     189     203     344     443
 92          RY  299.58  290.12  289.47  284.27  284.77  287.15  290.44  297.29
             *

 93          KK     6-A
 94          KM  BASIN 6-A EXISTING RUNOFF HYDROGRAPH
 95          BA  0.027
 96          LS              77
 97          UD     0.1
             *

 98          KK  FLOW-3
 99          KM  COMBINE BASIN 6-A HYDROGRAPH TO CR-1 HYDROGRAPH
100          HC      2
             *

101          KK    CR-2
102          KM  CHANNEL ROUTE FLOW-3 HYDROGRAPH TO FLOW-4 NODE
103          RD
104          RC     0.1   0.045     0.1     435  0.0104
105          RX       0     142     215     217     225     229     266  366.07
106          RY   294.7  283.95   282.6  278.65  278.73     283  283.59  294.78
             *

107          KK     6-B
108          KM  BASIN 6-B EXISTING RUNOFF HYDROGRAPH
109          BA  0.053
110          LS              71
111          UD    0.15
             *

112          KK  FLOW-4
113          KM  COMBINE BASIN 6-B HYDROGRAPH TO CR-2 HYDROGRAPH
114          HC      2
             *

115          KK    CR-3
116          KM  CHANNEL ROUTE FLOW-4 HYDROGRAPH TO FLOW-5 NODE
117          RD
118          RC     0.1  0.0575     0.1    2550   0.008
119          RX       0      32      66      75      85      89     161   220.2
120          RY  285.54  278.13  272.61  265.49  266.48  268.98  272.76   286.5
             *
                                   HEC-1 INPUT                                         PAGE  4
1
LINE         ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10

121          KK      7
122          KM  BASIN 7 EXISTING RUNOFF HYDROGRAPH
123          BA  0.048
124          LS              73
125          UD     0.1
             *

126          KK  FLOW-5
127          KM  COMBINE BASIN 7 HYDROGRAPH TO CR-3 HYDROGRAPH
128          HC      2
             *
129          ZZ
1
           SCHEMATIC DIAGRAM OF STREAM NETWORK
INPUT
 LINE      (V) ROUTING          (--->) DIVERSION OR PUMP FLOW

 NO.       (.) CONNECTOR        (<---) RETURN OF DIVERTED OR PUMPED FLOW

   9          1
              V
              V
  41        POND
              .
  48          .             2
              .             .
  53       FLOW-1............
              .
  56          .             5
              .             .
  61       FLOW-2............
              .
  64          .             3
              .             V
              .             V
  69          .          X-POND
              .             .
  76          .             .            4
              .             .            .
  81          .           COMB1...........
              .             .
  84        COMB2............
              V
              V
  87        CR-1
              .
  93          .            6-A
              .             .
  98       FLOW-3............
              V
              V
 101        CR-2
              .
 107          .            6-B
              .             .
 112       FLOW-4............
              V
              V
 115        CR-3
              .
 121          .             7
              .             .
 126       FLOW-5............

   PEAK FLOW AND STAGE (END-OF-PERIOD) SUMMARY FOR MULTIPLE PLAN-RATIO ECONOMIC COMPUTATIONS
                 FLOWS IN CUBIC FEET PER SECOND,  AREA IN SQUARE MILES
                              TIME TO PEAK IN HOURS

                                                      RATIOS APPLIED TO PRECIPITATION
OPERATION       STATION     AREA   PLAN          RATIO 1  RATIO 2  RATIO 3  RATIO 4
                                                    3.20     5.20     7.30     3.30

HYDROGRAPH AT
+                  1         .20     1   FLOW       345.     636.     939.     359.
                                         TIME      12.00    12.00    12.00    12.00

ROUTED TO
+               POND         .20     1   FLOW        34.     106.     532.      37.
                                         TIME      12.67    12.42    12.17    12.58

                                  ** PEAK STAGES IN FEET **
                                     1   STAGE    306.81   310.78   312.56   307.02
                                         TIME      12.67    12.42    12.17    12.58

HYDROGRAPH AT
+                  2         .03     1   FLOW        30.      74.     123.      32.
                                         TIME      12.00    12.00    12.00    12.00

 2 COMBINED AT
+             FLOW-1         .24     1   FLOW        49.     136.     600.      52.
                                         TIME      12.00    12.08    12.08    12.00

HYDROGRAPH AT
+                  5         .06     1   FLOW        50.     115.     190.      53.
                                         TIME      12.08    12.08    12.00    12.08

 2 COMBINED AT
+             FLOW-2         .29     1   FLOW        98.     251.     789.     104.
                                         TIME      12.08    12.08    12.08    12.08

HYDROGRAPH AT
+                  3         .08     1   FLOW       102.     214.     334.     107.
                                         TIME      12.00    12.00    12.00    12.00

ROUTED TO
+             X-POND         .08     1   FLOW        76.     187.     294.      82.
                                         TIME      12.08    12.08    12.08    12.08

                                  ** PEAK STAGES IN FEET **
                                     1   STAGE    297.00   298.54   299.64   297.10
                                         TIME      12.08    12.08    12.08    12.08

HYDROGRAPH AT
+                  4         .02     1   FLOW        13.      32.      55.      13.
                                         TIME      12.00    12.00    12.00    12.00

 2 COMBINED AT
+              COMB1         .10     1   FLOW        86.     213.     349.      93.
                                         TIME      12.08    12.08    12.00    12.08

 2 COMBINED AT
+              COMB2         .39     1   FLOW       184.     464.    1125.     197.
                                         TIME      12.08    12.08    12.08    12.08

ROUTED TO
+               CR-1         .39     1   FLOW       168.     451.    1034.     179.
                                         TIME      12.17    12.08    12.17    12.08

HYDROGRAPH AT
+                6-A         .03     1   FLOW        27.      62.     102.      28.
                                         TIME      12.00    12.00    12.00    12.00

 2 COMBINED AT
+             FLOW-3         .42     1   FLOW       187.     499.    1078.     202.
                                         TIME      12.08    12.08    12.17    12.08

ROUTED TO
+               CR-2         .42     1   FLOW       181.     478.    1055.     192.
                                         TIME      12.17    12.08    12.17    12.08

HYDROGRAPH AT
+                6-B         .05     1   FLOW        32.      86.     150.      34.
                                         TIME      12.08    12.08    12.08    12.08

 2 COMBINED AT
+             FLOW-4         .47     1   FLOW       209.     564.    1165.     226.
                                         TIME      12.08    12.08    12.17    12.08

ROUTED TO
+               CR-3         .47     1   FLOW       204.     530.    1112.     220.
                                         TIME      12.25    12.25    12.33    12.25

HYDROGRAPH AT
+                  7         .05     1   FLOW        38.      97.     166.      40.
                                         TIME      12.00    12.00    12.00    12.00

 2 COMBINED AT
+             FLOW-5         .52     1   FLOW       216.     558.    1145.     233.
                                         TIME      12.25    12.25    12.33    12.25
1
*** NORMAL END OF HEC-1 ***
```

```
X     X  XXXXXXX   XXXXX          X
X     X  X        X     X        XX
X     X  X        X               X
XXXXXXX  XXXX     X        XXXXX  X
X     X  X        X               X
X     X  X        X     X         X
X     X  XXXXXXX   XXXXX         XXX

THIS PROGRAM REPLACES ALL PREVIOUS VERSIONS OF HEC-1 KNOWN AS HEC1 (JAN 73), HEC1GS, HEC1DB, AND HEC1KW.

THE DEFINITIONS OF VARIABLES -RTIMP- AND -RTIOR- HAVE CHANGED FROM THOSE USED WITH THE 1973-STYLE INPUT STRUCTURE.
THE DEFINITION OF -AMSKK- ON RM-CARD WAS CHANGED WITH REVISIONS DATED 28 SEP 81. THIS IS THE FORTRAN77 VERSION
NEW OPTIONS: DAMBREAK OUTFLOW SUBMERGENCE , SINGLE EVENT DAMAGE CALCULATION, DSS:WRITE STAGE FREQUENCY,
DSS:READ TIME SERIES AT DESIRED CALCULATION INTERVAL.  LOSS RATE:GREEN AND AMPT INFILTRATION
KINEMATIC WAVE: NEW FINITE DIFFERENCE ALGORITHM

                                   HEC-1 INPUT                                         PAGE  1
1
LINE         ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10

  1          ID        WILLOW OAKS PROPOSED BMP/SWM POND AND OUTFALL
  2          ID        FAIRFAX COUNTY, VIRGINIA
  3          ID        SCS TYPE II, 24-HOUR RAINFALL DISTRIBUTION
  4          ID        FAIRFAX COUNTY PFM RAINFALL DEPTHS
  5          ID        ULTIMATE CONDITIONS DEVELOPMENT
  6          ID        SPILLWAY DESIGN MODEL
  7          ID        SDF = 1.5 X 100-YR; FBH = 2.5 X 100-YR
             *DIAGRAM
  8          IT      5                   300
  9          IO      5
             *          SDF     FBH
 10          JR   PREC  10.95   18.25
             *

 11          KK     ULT
 12          KM  BASIN ULTIMATE RUNOFF
 13          BA  0.203
 14          PB      1
             * SCS TypeII Rainfall Distribution Pattern
 15          IN      6
 16          PC     0.0  .00101  .00202  .00305  .00408  .00513  .00618  .00725  .00832  .00941
 17          PC  .01050  .01161  .01272  .01385  .01498  .01613  .01728  .01845  .01962  .02081
 18          PC    .022  .02321  .02442  .02565  .02688  .02813  .02938  .03065  .03192  .03321
 19          PC  .03450  .03581  .03712  .03845  .03978  .04113  .04248  .04385  .04522  .04661
 20          PC    .048  .04941  .05084  .05229  .05376  .05525  .05676  .05829  .05984  .06141
 21          PC    .063  .06461  .06624  .06789  .06956  .07125  .07296  .07469  .07644  .07821
 22          PC     .08  .08181  .08364  .08549  .08736  .08925  .09116  .09309  .09504  .09701
 23          PC    .099  .10101  .10304  .10509  .10716  .10925  .11136  .11349  .11564  .11781
 24          PC     .12  .12225  .12460  .12705  .12960  .13225    .135  .13785  .14080  .14385
 25          PC    .147   .1502  .15340   .1566   .1598    .163  .16628  .16972  .17332  .17708
 26          PC    .181  .18512  .18948  .19408  .19892    .204   .2094   .2152   .2214    .228
 27          PC    .235  .24268  .25132  .26092  .27148    .283  .30684  .35436  .43079  .56786
 28          PC    .663  .68196  .69864  .71304  .72516    .735  .74344  .75136  .75876  .76564
 29          PC    .772  .77796  .78364  .78904  .79416    .799   .8036    .808   .8122   .8162
 30          PC     .82  .82367  .82726  .83079  .83424  .83763  .84094  .84419  .84736  .85047
 31          PC  .85350  .85647  .85936  .86219  .86494  .86763  .87024  .87279  .87526  .87767
 32          PC     .88  .88229  .88455  .88679    .889  .89119  .89335  .89549   .8976  .89969
 33          PC  .90175  .90379   .9058  .90779  .90975  .91169   .9136  .91549  .91735  .91919
 34          PC    .921  .92279  .92455  .92629    .928  .92969  .93135  .93299   .9346  .93619
 35          PC  .93775  .93929   .9408  .94229  .94375  .94519   .9466  .94799  .94935  .95069
 36          PC    .952   .9533  .95459  .95588  .95716  .95844  .95971  .96098  .96224   .9635
 37          PC  .96475    .966  .96724  .96848  .96971  .97094  .97216  .97338  .97459   .9758
 38          PC    .977   .9782  .97939  .98058  .98176  .98294  .98411  .98528  .98644  .98760
 39          PC  .98875   .9899  .99104  .99218  .99331  .99444  .99556  .99668  .99779   .9989
 40          PC     1.0
 41          LS              89
 42          UD    0.10
             *
             * ASSUME PROP. RISER IS CLOGGED AND START ROUTING AT TOP OF EMERGENCY SPILLWAY
                                   HEC-1 INPUT                                         PAGE  2
1
LINE         ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10

 43          KK    POND
 44          KM  ROUTE BASIN ULT THROUGH PROPOSED SWM POND
 45          RS       1    ELEV  310.75
 46          SA    1.75    1.88    2.15    2.33    2.49     2.6    2.77    2.95    3.12    3.16
 47          SE     301     302     304     306     308     310     312     314     316   316.5
 48          SQ       0   184.5   916.7  2098.6    2444
 49          SE  310.75     312     314     316   316.5
             *
 50          ZZ

   PEAK FLOW AND STAGE (END-OF-PERIOD) SUMMARY FOR MULTIPLE PLAN-RATIO ECONOMIC COMPUTATIONS
                 FLOWS IN CUBIC FEET PER SECOND,  AREA IN SQUARE MILES
                              TIME TO PEAK IN HOURS

                                                 RATIOS APPLIED TO PRECIPITATION
OPERATION       STATION     AREA   PLAN          RATIO 1  RATIO 2
                                                   10.95    18.25

HYDROGRAPH AT
+                ULT         .20     1   FLOW      1458.    2483.
                                         TIME      12.00    12.00

ROUTED TO
+               POND         .20     1   FLOW      1273.    2231.
                                         TIME      12.08    12.00

                                  ** PEAK STAGES IN FEET **
                                     1   STAGE    314.60   316.19
                                         TIME      12.08    12.00

*** NORMAL END OF HEC-1 ***
```

Application No. RZ 87-P-038-5 Staff WOID
APPROVED DEVELOPMENT PLAN
(DP) (GDP) (CDP) (FDP)
SEE PROFFERS DATED 6/20/11
Date of (BOS) (PC) approval 7/26/11
Sheet 24 of 24

Dewberry®

Dewberry & Davis LLC
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INOVA
WILLOW OAKS

PARTIAL GENERALIZED
DEVELOPMENT PLAN AMENDMENT
PROVIDENCE DISTRICT
FAIRFAX COUNTY, VIRGINIA

SEAL
COMMONWEALTH OF VIRGINIA
TIMOTHY CHARLES CULLEITON
Lic. No. 20112
6.10.09
PROFESSIONAL ENGINEER

KEY PLAN
COMMONWEALTH OF VIRGINIA
EDMUND J. IGNACIO
Lic. No. 33579
4/27/11
PROFESSIONAL ENGINEER

SCALE

No.	DATE	BY	Description
10	06.10.09	ARW	
9	06.05.09	ARW	
8	05.20.09	ARW	
7	04.20.09	ARW	
6	03.26.09	ARW	
5	02.19.09	ARW	
4	01.23.09	ARW	
3	10.09.08	ARW	
2	08.28.08	ARW	
1	07.31.08	ARW	

REVISIONS

DRAWN BY JMC
APPROVED BY
CHECKED BY PGY
DATE April 14, 2008

TITLE
Inova
Willow Oaks
Partial Generalized Development
Plan Amendment
HEC-1 Models

PROJECT NO.

20

SHEET NO. 20 OF 20

M-10690