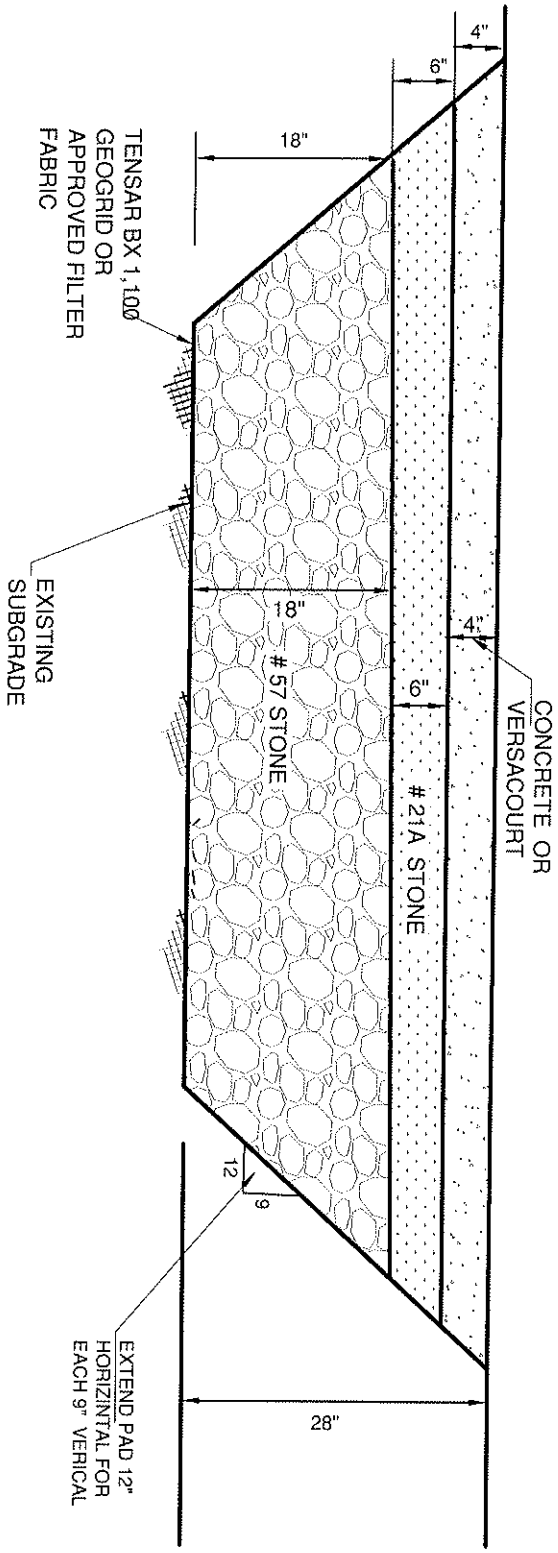
ATTACHMENTS

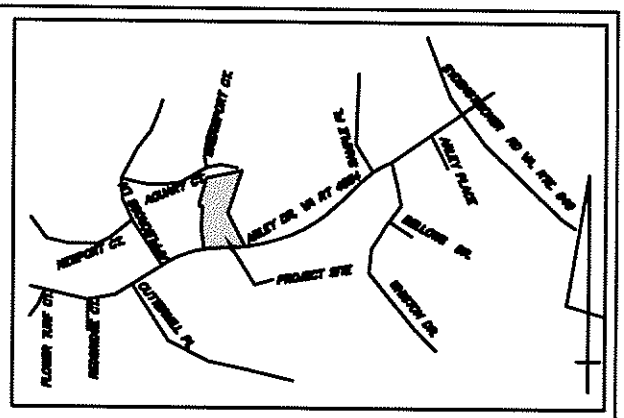


PROPOSED SPORT COURT'S PAD IMPROVEMENT

OPTIONS I & II

PROPOSED SPORT COURT'S PAD
IMPROVEMENT
SPRINGFIELD STATION HOME OWNERS'
ASSOCIATION SPORTS COURT
SPRINGFIELD , VIRGINIA 20152

GeoEnv Engineers
Civil, Environmental & Geotechnical Engineering
10875 Main Street, Suite 213
Fairfax, VA 22030
Tel. 703.591.7170
Fax. 703.591.7074



VICINITY MAP
N.T.S.

PRELIMINARY SITE PLAN
FOR
SPRINGFIELD STATION HOME OWNERS' ASSOCIATION (SSHOA)
REHABILITATION OF THE ASSOCIATION'S SPORT COURT AND ADJACENT AREA
ARLEY DRIVE (VA RT. 4554)
SPRINGFIELD, FAIRFAX COUNTY
VIRGINIA 22153

ENGINEER:

GeoEnv Engineers & Consultants, LLC:

Civil, Environmental & Geotechnical Engineering

10875 MAIN STREET, SUITE 213
FAIRFAX, VIRGINIA 22030
PHONE: 703-591-7170
FAX: 703-591-7074
WEBSITE: www.geoenvi.com

OWNER / DEVELOPER:

SPRINGFIELD STATION HOME OWNERS' ASSOCIATION
MS. DONNA McCRAITH
8712 WHITSON COURT
SPRINGFIELD, VA 22153
EMAIL: dmccraith@cox.net
PHONE: 703-644-0530, 703-731-7032 (CELL)

SHEET INDEX:

NOVEMBER 2010

[illegible]

THE PROJECT INVOLVES REHABILITATION OF THE SPRINGFIELD STATION HOME OWNERS' ASSOCIATION SPORT COURT AND ADJACENT AREA, ARLEY DRIVE VA RT. 4554, SPRINGFIELD, FAIRFAX COUNTY VIRGINIA 22153. THE SITE CONTAINS 87,304 SF (2.008 AC) OF LAND AND IS ZONED R-3C. THE WHOLE LOT OF THE PROPERTY IS WITHIN RESOURCE PROTECTION AREA (RPA). APPROXIMATELY 48.71% OF THE LOT IS COVERED BY TREE CANOPY. THE SITE CONTAINS SANITARY AND STORM SEWER EASEMENTS. A CREEK IS FLOWING ON THE REAR OF THE LOT.

[illegible]

DONNA McGRATH
SPRINGFIELD STATION, HOMEOWNERS ASSOCIATION, INC
8712 WHITSON COURT
SPRINGFIELD, VA 22153
PHONE NO: 703-644-0530

[illegible]

I HEREBY CERTIFY THAT ALL WETLANDS PERMITS REQUIRED BY LAW WILL BE OBTAINED PRIOR TO COMMENCING LAND DISTURBANCE ACTIVITIES.

OWNER NAME: ________ SIGNATURE ___/___/ 2010 DATE

[illegible]

I HEREBY CERTIFY THAT ALL APPROPRIATE COUNTY APPROVALS WERE OBTAINED IN ACCORDANCE WITH THE PROCESS REQUIRED BY THE SUBDIVISION ORDINANCE IN EFFECT AT THE TIME OF THE CREATION. THE LOT WAS CREATED AS PART OF SPRINGFIELD DISTRICT, ROLLING VALLEY SUBDIVISION PARCEL A, AS APPROVED BY FAIRFAX COUNTY AND RECORDED IN DEED BOOK 3408, PAGE 662 AMONG THE FAIRFAX COUNTY LAND RECORDS.

IBRAHIM A. CHEHAB, PE ________ ___/___/2010
ENGINEER'S NAME: SIGNATURE DATE

[illegible]

THIS PLAN COMPLIES FULLY WITH AMENDMENT CHAPTER 118 (CHESAPEAKE BAY PRESERVATION ORDINANCE) OF THE CODE OF THE COUNTY OF FAIRFAX, EFFECTIVE NOV. 18, 2003.

[illegible]

1. PARCEL IDENTIFICATION # :089-3-((08))-A
2. ZONE: R-3C
3. SET BACK REQUIRMENTS :
   FRONT = 20 FT
   REAR= 25 FT
   SIDE = 8/20 FT (TOTAL)
4. CONTOUR INTERVAL: 2' DATUM: USGS
5. BOUNDARY INFORMATION WAS TAKEN FROM THE AVAILABLE RECORDS. NO TITLE REPORT WAS FURNISHED.
6. THE LOCATIONS AND DEPTH OF ALL UNDERGROUND UTILITIES SHOWN HEREON WERE TAKEN FROM AVAILABLE RECORDS.
7. THE LOCATIONS AND DEPTHS OF ALL EXISTING UNDERGROUND UTILITIES ARE TO BE VERIFIED BY THE CONTRACTOR PRIOR TO THE START OF CONSTRUCTION. INTERFERENCE OR DISRUPTION OF SAME WILL BE THE RESPONSIBILITY OF THE CONTRACTOR.
8. THE WHOLE LOT IS WITHIN RPA AREA.

[illegible]

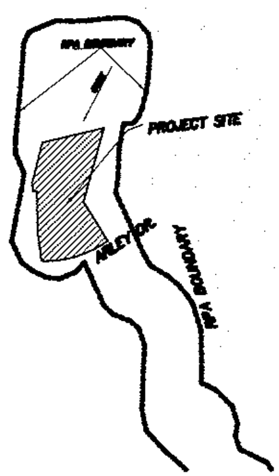
TENNIS COURT = 13,382 SF
BASKETBALL COURT= 4,416 SF
TRAIL = 2,834 SF
TOTAL = 20,632 SF

% OF IMPERVIOUS AREA = 20,632/ 78,504 = 26.28%

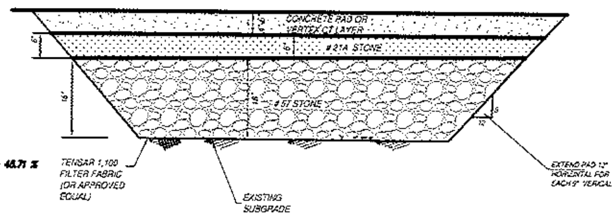
[illegible]

TREE SAVE AREA I= 32,745 SF
TREE SAVE AREA II= 3,137 SF
TOTAL AREA = 35,882 SF
% OF TREE CANOPY AREA = 35,882/78,504 x 100 = 45.71 %

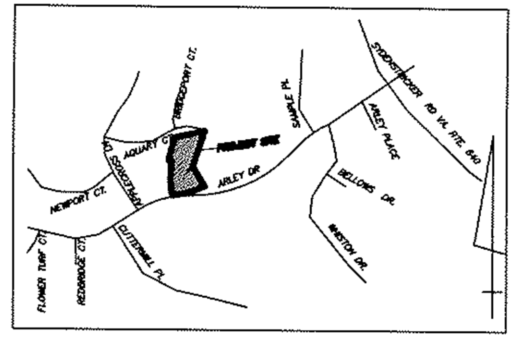
[illegible]



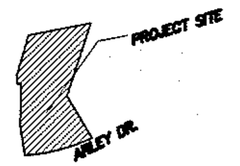
RPA MAP (2003)
SCALE:1"= 200'



PROPOSED SPORT COURT'S PAD IMPROVEMENT
OPTIONS I & II



VICINITY MAP
N.T.S.



SOIL MAP
SCALE:1"=200'

SOIL DESCRIPTION:

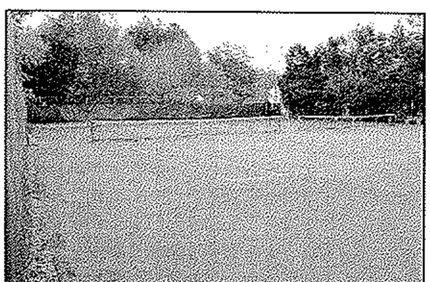
(1) MIXED ALLUVIAL
THIS CHANNEL-DISSECTED SOIL COMPLEX OCCURS IN FLOODPLAINS AND DRAINAGEWAYS, AND IS SUSCEPTIBLE TO FLOODINGS. SOIL MATERIALS RANGE FROM SOFT ORGANIC SILTS AND CLAYS TO DENSE GRAVEL-SAND-SILT-CLAY ALLUVIUM. THE SEASONAL HIGH WATER TABLE VARIES FROM 0 TO 2.5 FEET BELOW THE SURFACE. DEPTH TO HARD BEDROCK RANGES FROM 3 TO 30 FEET. PERMEABILITY IS VARIABLE. SOIL STRENGTH MAY BE POOR BECAUSE OF SOFT SOIL AND SEASONAL SATURATION. SEPTIC DRAINFIELDS AND INFILTRATION TRENCHES ARE POORLY SUITED BECAUSE OF WETNESS AND FLOODING POTENTIAL. STREAM BANK EROSION WITHIN THESE SOILS MAY RESULT IN UNDERCUTTING OF EMBANKMENTS ON ADJACENT PROPERTIES. HYDRIC SOILS, WHICH MAY INCLUDE NONTIDAL WETLANDS, OCCUR WITHIN THIS MAPPING UNITS.

SOIL DATA:

SOIL ID NUMBER	SERIES NAME	FOUNDATION SUPPORT	SUBSURFACE DRAINAGE	SLOPE STABILITY	ERODIBILITY	SOIL TYPE	GEOTECHNICAL REPORT REQ'D	LOT COVERAGE
1A	MIXED ALLUVIAL	POOR	POOR	MARGINAL	SLIGHT	A	YES	100%

[illegible]

- EDGE OF PAVEMENT
- WATER LINE
- EX. 2' CONTOUR LINE
- PROP. 2' CONTOUR LINE
- EX. SPOT ELEVATION
- PROP. SPOT ELEVATION
- EX. SANITARY SEWER
- FLOW ARROW
- EX. BOARD FENCE
- EX. TREE
- RPA BOUNDARY 2003
- CREEK
- TEMP CONST ENTRANCE WITH WASHRACK, SPEC 3.02
- EXISTING POWER POLE
- (SF) SILT FENCE, SPEC 3.05
- (SSF) SUPER SILT FENCE
- TREE PROTECTION, SPEC 3.38
- LIMIT OF DISTURBANCE
- EX. FIRE HYDRANT
- 25' OFFSET FROM LOD
- TREE SAVE AREA



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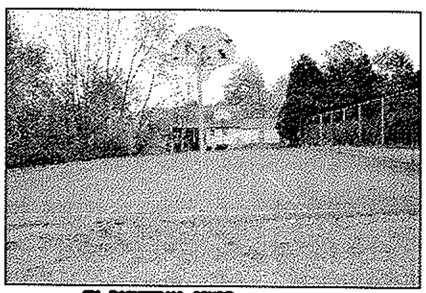

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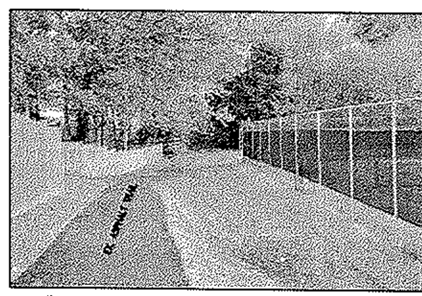


[illegible]

TAX MAP:	89-3-((08))-A
DATE:	NOV 2010
PREP. BY:	RAM
CHECKED BY:	ABE
PROJECT #:	# 1895
SCALE:	1"= 30'
PAGE 2 OF 7	2

GENERAL NOTES

SPRINGFIELD STATION HOME OWNERS' ASSOCIATION INC., ARLEY DRIVE, SPRINGFILED
PARCEL A, SEC 8B, ROLLING VALLEY
SPRINGFIELD DISTRICT
FARIFAX COUNTY, VIRGINIA 22153

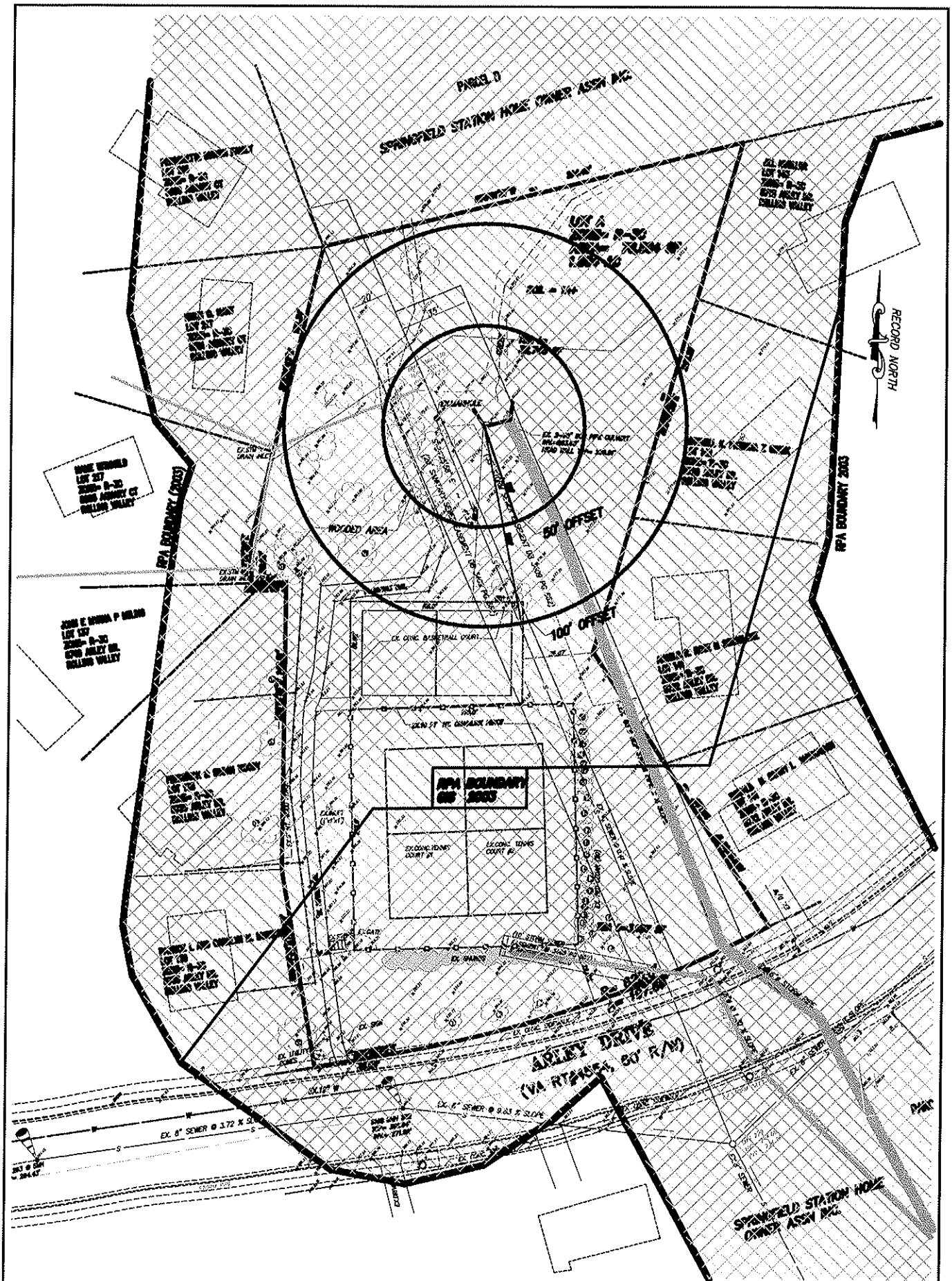
PROFESSIONAL SEAL
COMMONWEALTH OF VIRGINIA
IBRAHIM A. CHEHAB
PROFESSIONAL ENGINEER

REVISION BLOCK

NO.	DESCRIPTION	REV. BY	APPROVED BY	DATE

COUNTY PLAN NUMBER:

GeoEnv Engineers & Consultants, LLC
Civil, Environmental & Geotechnical Engineering



TAX MAP:	89-3-((16))-A
DATED:	NOV 2010
PREP. BY:	RAH
CHECKED BY:	ABE
PROJECT #:	1999
SCALE:	1"= 20'
PAGE 3 OF 7	3

RPA BOUNDARY MAP (2003)

SPRINGFIELD STATION HOME OWNERS' ASSOCIATION INC., ARLEY DRIVE, SPRINGFILED
PARCEL A, SEC 8B, ROLLING VALLEY
SPRINGFIELD DISTRICT
FAIRFAX COUNTY, VIRGINIA 22153

PROFESSIONAL SEAL

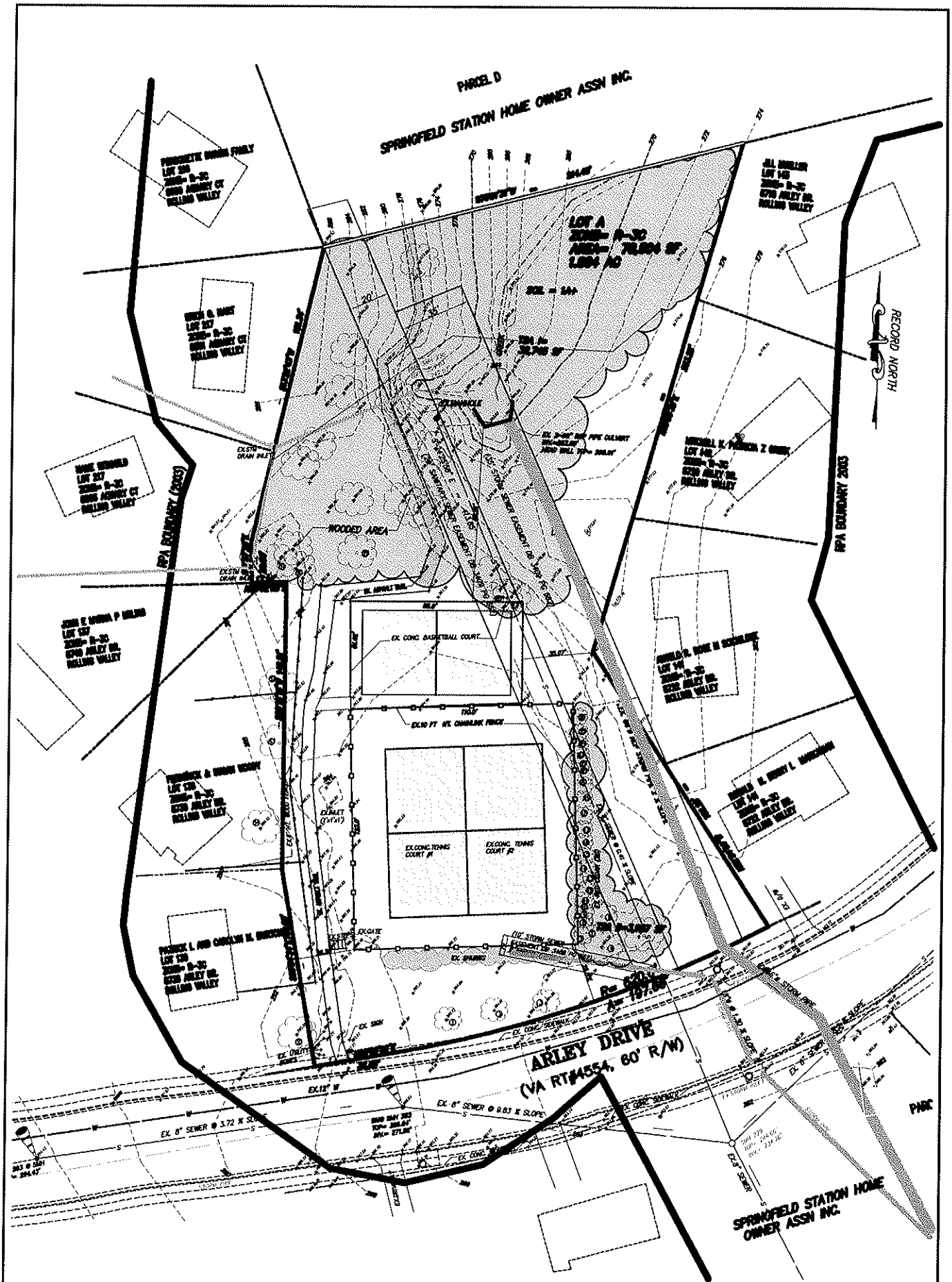
COMMONWEALTH OF VIRGINIA — BRIAN J. CHIDA — Lic. No. 022966 — PROFESSIONAL ENGINEER

REVISION BLOCK

NO.	DESCRIPTION	REV. BY APPROVED BY	DATE

COUNTY PLAN NUMBER:

Engineers & Consultants, LLC
Civil, Environmental & Geotechnical, Engineering
10530 Main Street, Suite 313
Fairfax, VA 22030
Tel. 703.691.7170
Fax 703.691.7069
Web Site: gaconsl.com



TAX MAP:	89-3-((16))-A
DATE:	NOV 2010
PREP. BY:	PAH
CHECKED BY:	ARC
PROJECT #:	1660
SCALE:	1"= 20'
PAGE 4 OF 7	4

EXISTING CONDITION PLAN

SPRINGFIELD STATION HOME OWNERS' ASSOCIATION INC., ARLEY DRIVE, SPRINGFILED
PARCEL A, SEC 8B, ROLLING VALLEY
SPRINGFIELD DISTRICT
FARIFAX COUNTY, VIRGINIA 22153

PROFESSIONAL SEAL

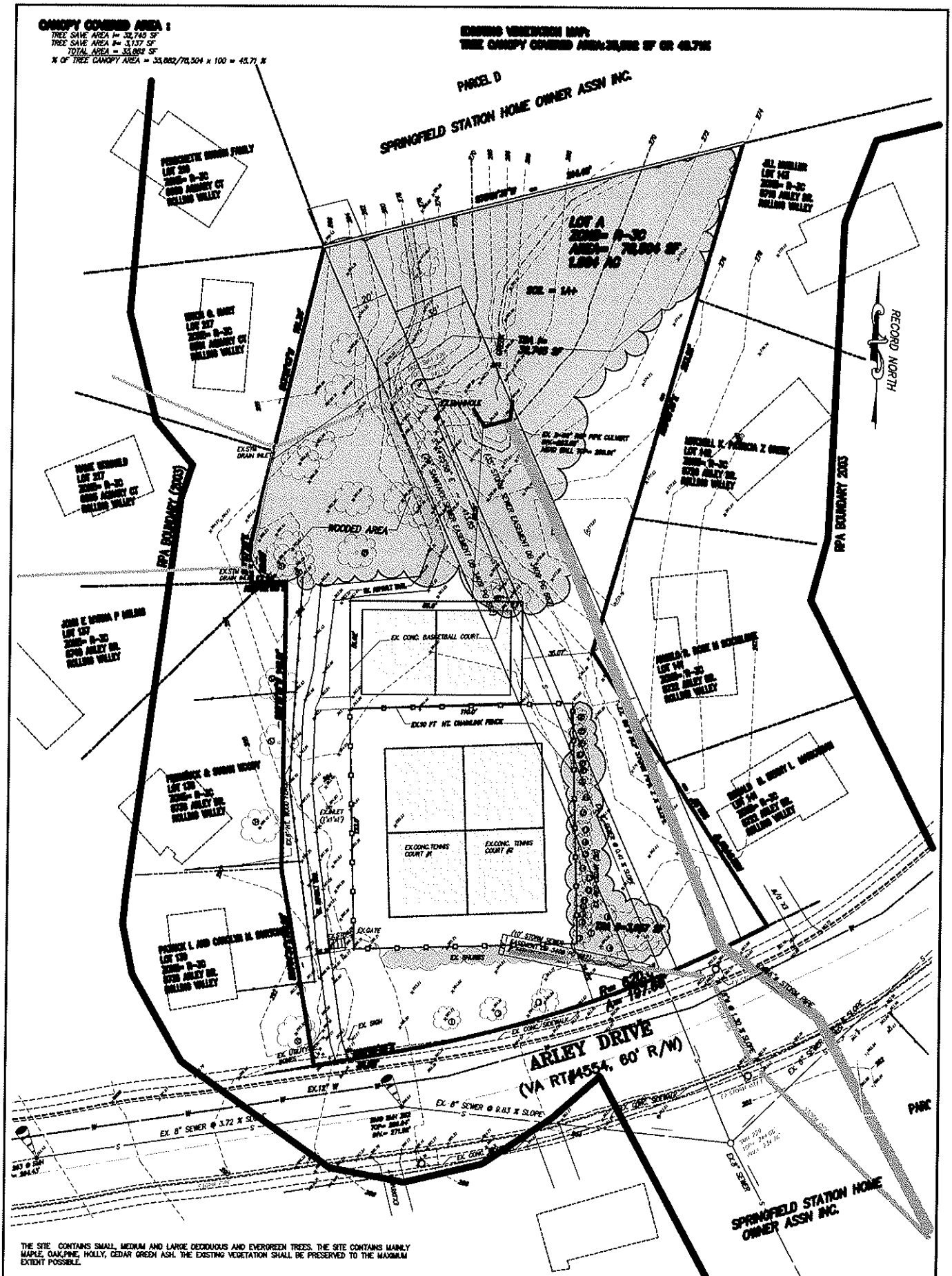
COMMONWEALTH OF VIRGINIA — WILLIAM A. CROSS — Lic. No. 022868 — PROFESSIONAL ENGINEER

REVISION BLOCK

NO.	DESCRIPTION	REV. BY	APPROVED BY	DATE

COUNTY PLAN NUMBER:

CROSS PROPERTY — Engineers & Consultants, LLC
Civil, Environmental & Geotechnical, Engineering
10530 Main Street, Suite 203
Fairfax, VA 22030
Tel. 703.591.7170
Fax 703.591.7694
Web Site: gocross.com



THE SITE CONTAINS SMALL, MEDIUM AND LARGE DECIDUOUS AND EVERGREEN TREES. THE SITE CONTAINS MAINLY MAPLE, OAK,PINE, HOLLY, CEDAR GREEN ASH. THE EXISTING VEGETATION SHALL BE PRESERVED TO THE MAXIMUM EXTENT POSSIBLE.

TAX MAP:	89-3-((16))-A
DATE:	NOV 2010
PREP. BY:	RAH
CHECKED BY:	ARE
PROJECT #	# 1985
SCALE:	1"= 20'
PAGE 5 OF 7	5

EXISTING VEGETATION PLAN

SPRINGFIELD STATION HOME OWNERS' ASSOCIATION INC., ARLEY DRIVE, SPRINGFILED PARCEL A, SEC 8B, ROLLING VALLEY

SPRINGFIELD DISTRICT

FARIFAX COUNTY, VIRGINIA 22153

PROFESSIONAL SEAL

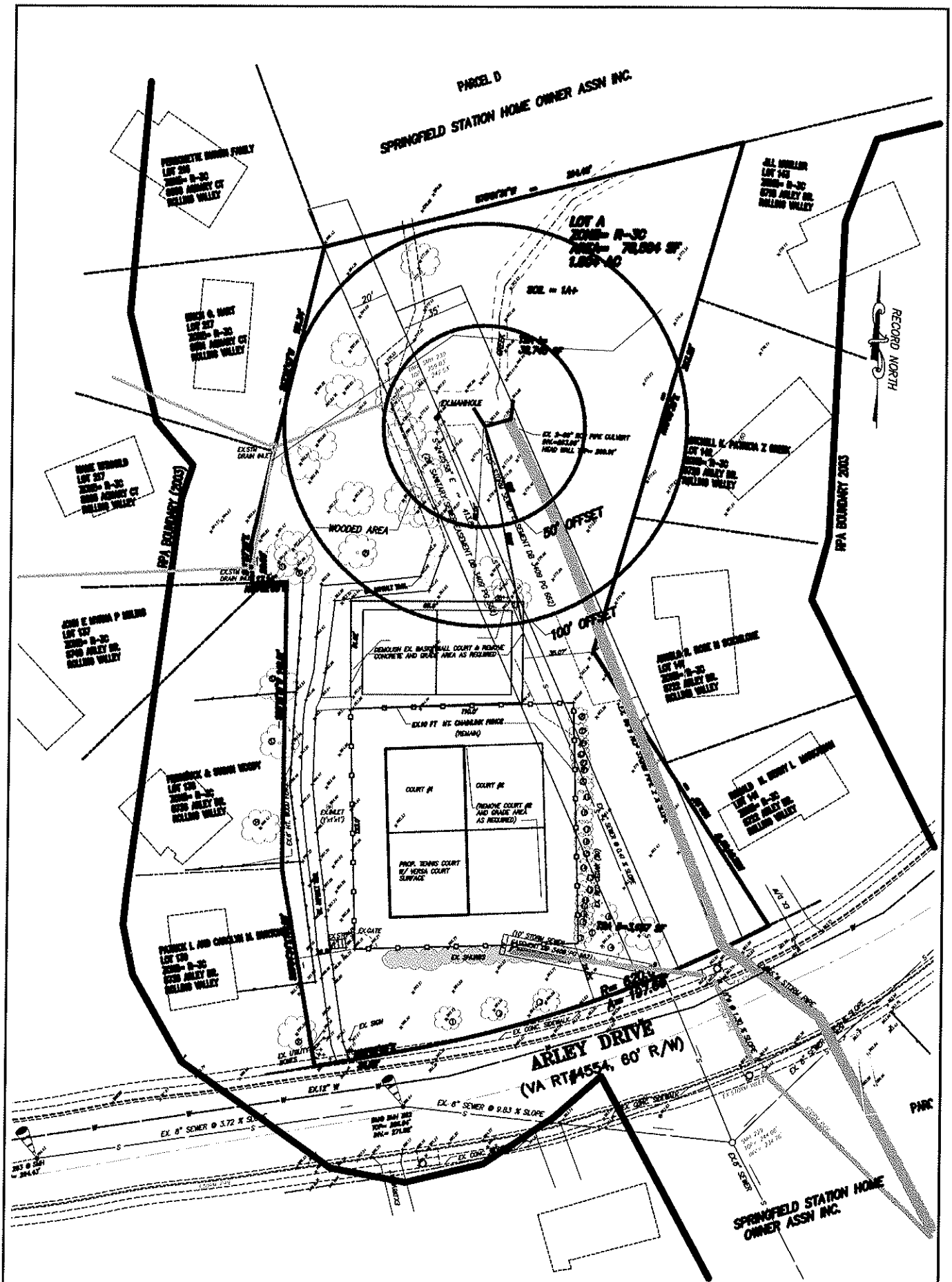
COMMONWEALTH OF VIRGINIA — WILLIAM J. CROUCH — Lic. No. 022569 — PROFESSIONAL ENGINEER

REVISION BLOCK

NO.	DESCRIPTION	REV. BY	APPROVED BY	DATE

COUNTY PLAN NUMBER:

CEI ENV Engineers & Consultants, LLC
Civil, Environmental & Geotechnical Engineering
10529 Main Street, Suite 203
Fairfax, VA 22030
Tel. 703.591.7170
Fax. 703.591.7174
Web Site: geiweb.com



TAX MAP:	89-3-((10))-A
DATE:	NOV 2010
PREP. BY:	RAH
CHECKED BY:	ABC
PROJECT #:	# 1865
SCALE:	1"=20'
PAGE 6(I) OF 7	6(II)

PRELIMINARY PLAN (OPTION II)

SPRINGFIELD STATION HOME OWNERS' ASSOCIATION INC., ARLEY DRIVE, SPRINGFILED
PARCEL A, SEC 8B, ROLLING VALLEY
SPRINGFIELD DISTRICT
FAIRFAX COUNTY, VIRGINIA 22153

PROFESSIONAL SEAL

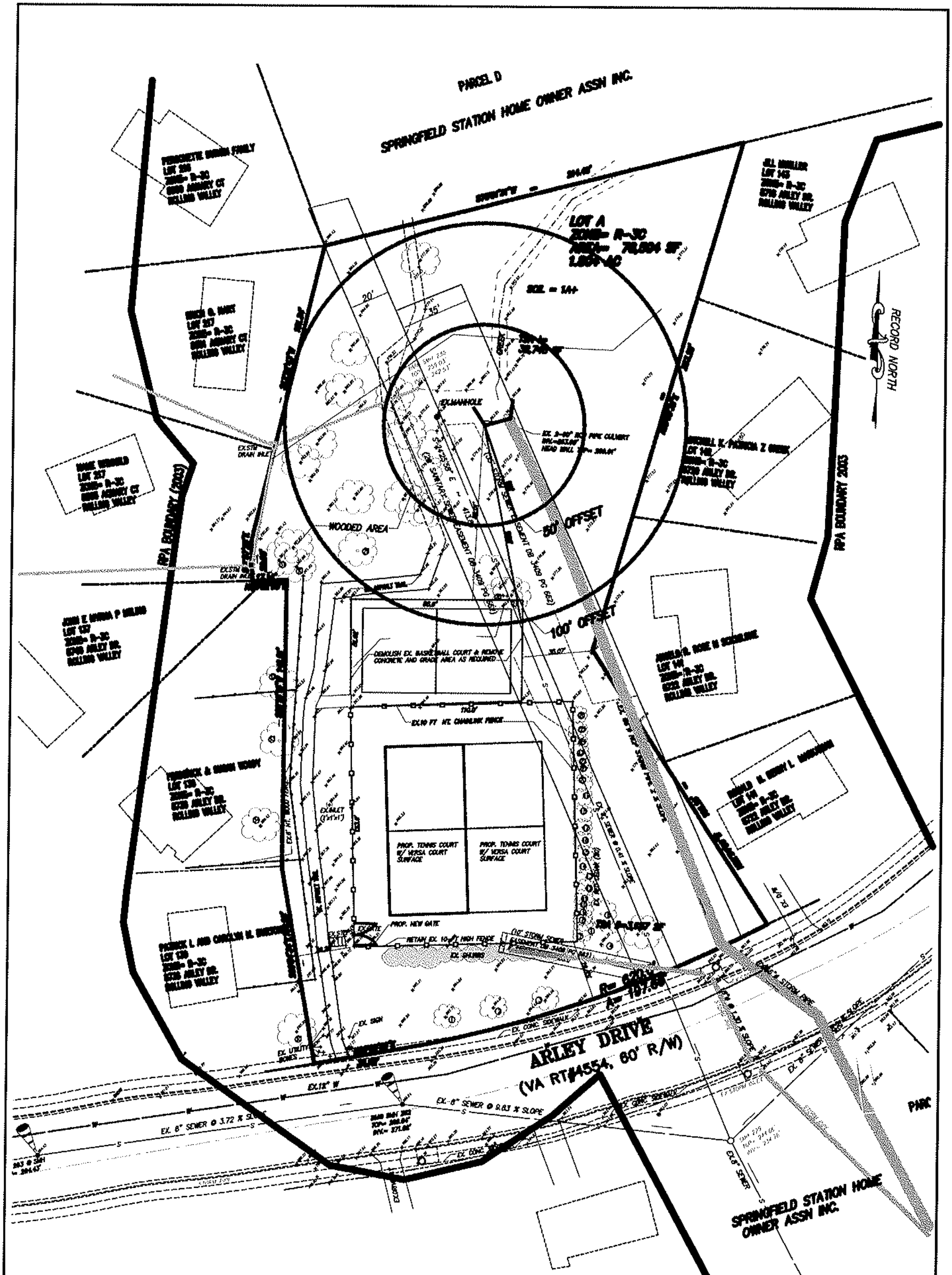
COMMONWEALTH OF VIRGINIA — PROFESSIONAL ENGINEER

REVISION BLOCK

NO.	DESCRIPTION	REV. BY	APPROVED BY	DATE

COUNTY PLAN NUMBER:

Engineers & Consultants, LLC
Civil, Environmental & Geotechnical, Engineering
10530 Main Street, Suite 303
Fairfax, VA 22030
Tel. 703.591.7170
Fax. 703.591.7074
Web Site: geoenv.com


PARCEL D
SPRINGFIELD STATION HOME OWNER ASSN INC.
LOT A
WOODED AREA
50' OFFSET
100' OFFSET
EX. MANHOLE
RECORD NORTH
RPA BOUNDARY (2003)
RPA BOUNDARY 2003
DEMOLISH EX. BASKETBALL COURT & REMOVE CONCRETE AND GRADE AREA AS REQUIRED
EX.10 FT HT. CHAINLINK FENCE
PROP. TENNIS COURT W/ VERSA COURT SURFACE
PROP. TENNIS COURT W/ VERSA COURT SURFACE
PROP. NEW GATE
RETAIN EX. 10 FT HIGH FENCE
EX. SHRUBS
EX. CONC. SIDEWALK
ARLEY DRIVE
(VA RT#4554, 60' R/W)
EX. 8" SEWER @ 3.72 % SLOPE
EX. 8" SEWER @ 9.63 % SLOPE
SPRINGFIELD STATION HOME OWNER ASSN INC.

TAX MAP:	89-3-((06))-A
DATE:	NOV 2010
PREP. BY:	RAM
CHECKED BY:	ARE
PROJECT #	# 1895
SCALE:	1"= 20'
PAGE 6(I) OF 7	6 (I)

PRELIMNARY PLAN (OPTION I)

SPRINGFIELD STATION HOME OWNERS' ASSOCIATION INC., ARLEY DRIVE, SPRINGFILED
PARCEL A, SEC 8B, ROLLING VALLEY
SPRINGFIELD DISTRICT
FARIFAX COUNTY, VIRGINIA 22153

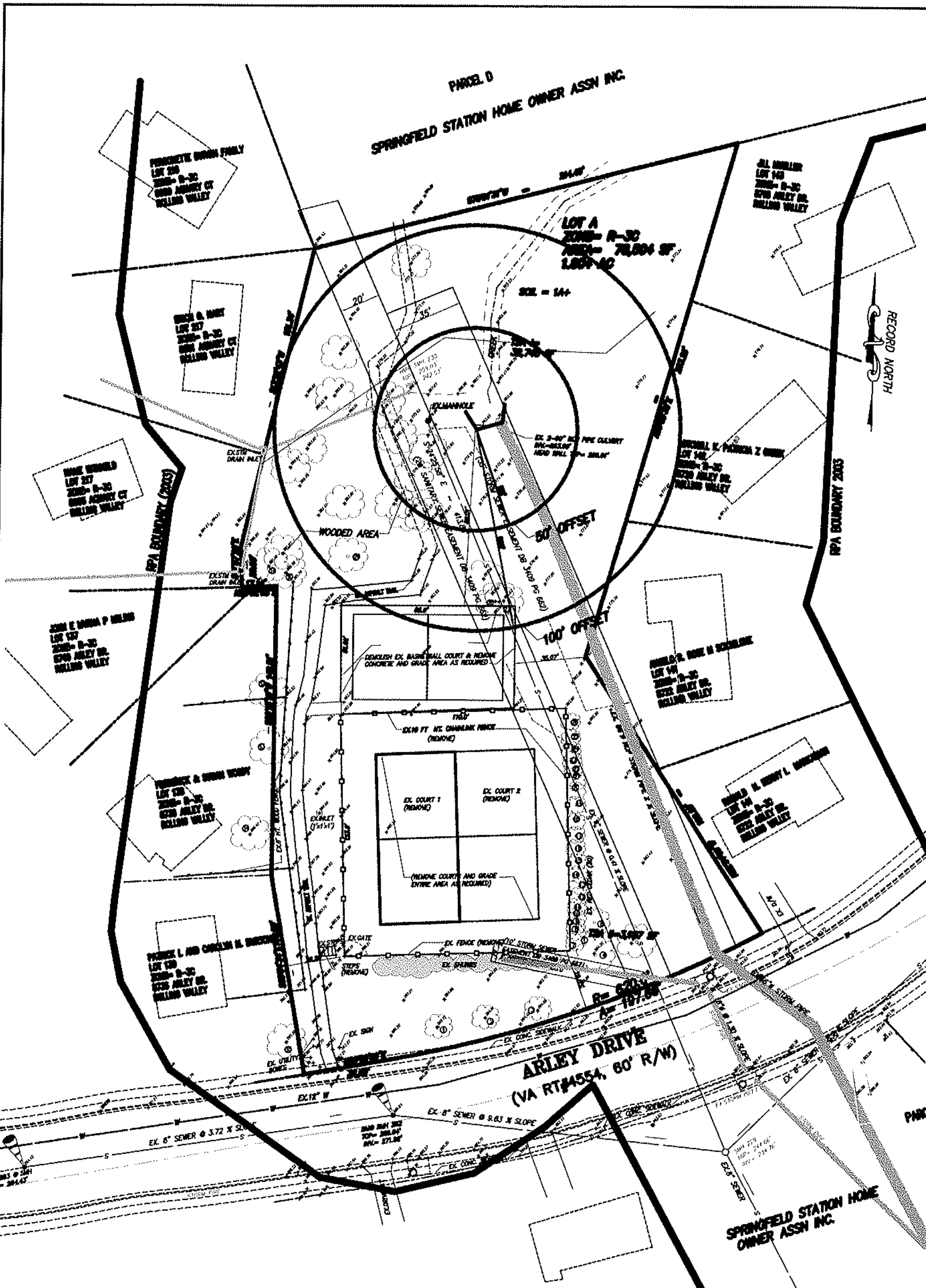
PROFESSIONAL SEAL

REVISION BLOCK

NO.	DESCRIPTION	REV. BY	APPROVED BY	DATE

COUNTY PLAN NUMBER:

GeoEnv Engineers & Consultants, LLC
Civil, Environmental & Geotechnical, Engineering


PARCEL D
SPRINGFIELD STATION HOME OWNER ASSN INC.
LOT A
SOIL = 1A+
RECORD NORTH
EX.MANHOLE
WOODED AREA
50' OFFSET
100' OFFSET
RPA BOUNDARY (2003)
DEMOLISH EX. BASKETBALL COURT & REMOVE CONCRETE AND GRADE AREA AS REQUIRED
EX. COURT 1 (REMOVE)
EX. COURT 2 (REMOVE)
(REMOVE COURTS AND GRADE ENTIRE AREA AS REQUIRED)
EX. GATE
STEPS (REMOVE)
EX. SHRUBS
EX. SIGN
EX. CONC. SIDEWALK
ARLEY DRIVE
(VA RT#4554, 60' R/W)
EX. 8" SEWER @ 3.72 % SLOPE
EX. 8" SEWER @ 9.63 % SLOPE
SPRINGFIELD STATION HOME OWNER ASSN INC.

TAX MAP:	89-3-((06))-A
DATE:	NOV 2010
PREP. BY:	RAM
CHECKED BY:	ABE
PROJECT #	# 1890
SCALE:	1"= 20'
PAGE 6 OF 7	6(III)

PRELIMNARY PLAN (OPTION III)

SPRINGFIELD STATION HOME OWNERS' ASSOCIATION INC., ARLEY DRIVE, SPRINGFILED
PARCEL A, SEC 8B, ROLLING VALLEY
SPRINGFIELD DISTRICT
FARIFAX COUNTY, VIRGINIA 22153

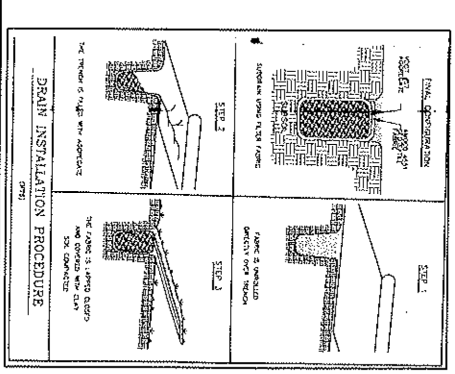
PROFESSIONAL SEAL

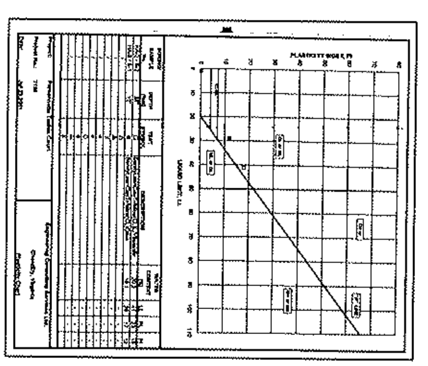
REVISION BLOCK

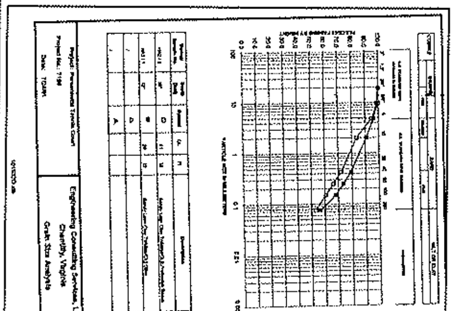
NO.	DESCRIPTION	REV. BY	APPROVED BY	DATE

COUNTY PLAN NUMBER:

GeoEnv Engineers & Consultants, LLC
Civil, Environmental & Geotechnical Engineering







TAX MAP:	[illegible]
DATE:	NOV 2010
PREP. BY:	RAM
CHECKED BY:	ABE
PROJECT #:	# 1060
SCALE:	
PAGE 7 of 7	7

SOIL PROFILES & REPORTS

SPRINGFIELD STATION HOME OWNERS' ASSOCIATION INC., ARLEY DRIVE, SPRINGFILED
PARCEL A, SEC 8B, ROLLING VALLEY
SPRINGFIELD DISTRICT
FARIFAX COUNTY, VIRGINIA 22153

PROFESSIONAL SEAL
COMMONWEALTH OF VIRGINIA — PROFESSIONAL ENGINEER

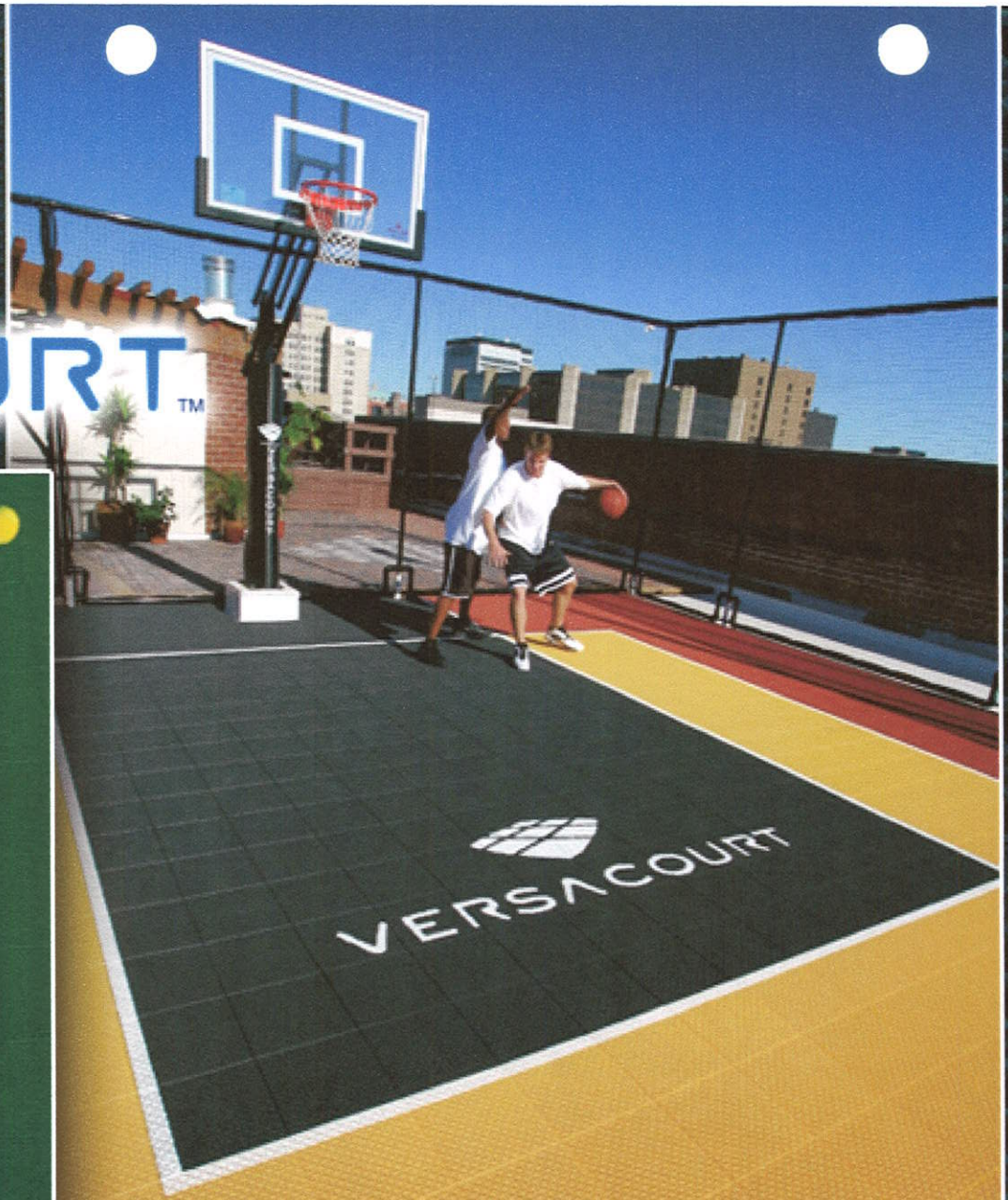
REVISION BLOCK

NO.	DESCRIPTION	REV. BY	APPROVED BY	DATE

COUNTY PLAN NUMBER:

GeoEnv Engineers & Consultants, LLC
Civil, Environmental & Geotechnical Engineering
[illegible]
Tel. [illegible]
Fax. [illegible]
Web Site: [illegible]

VERSACOURT™

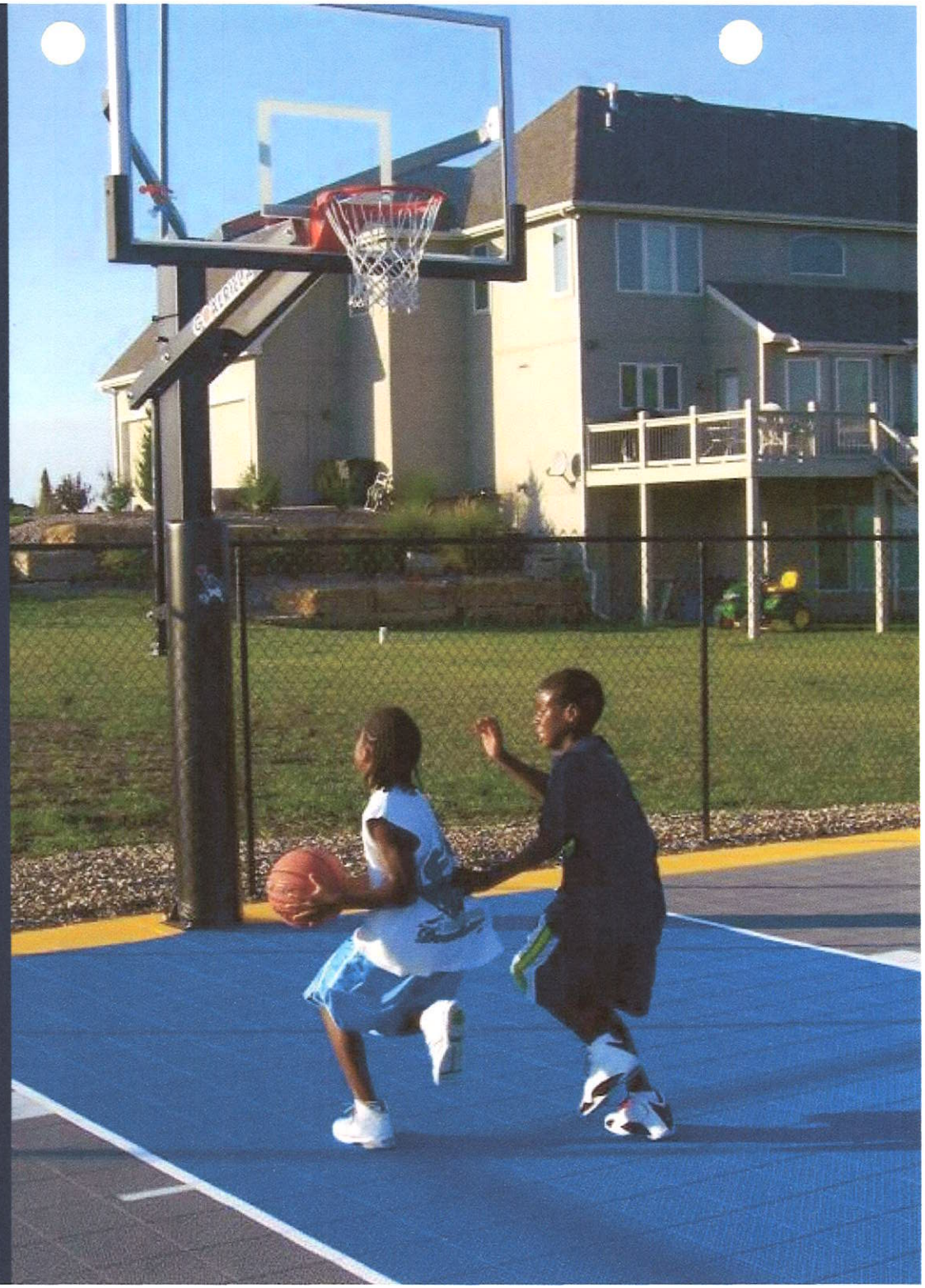


The Ultimate Athletic Court System!

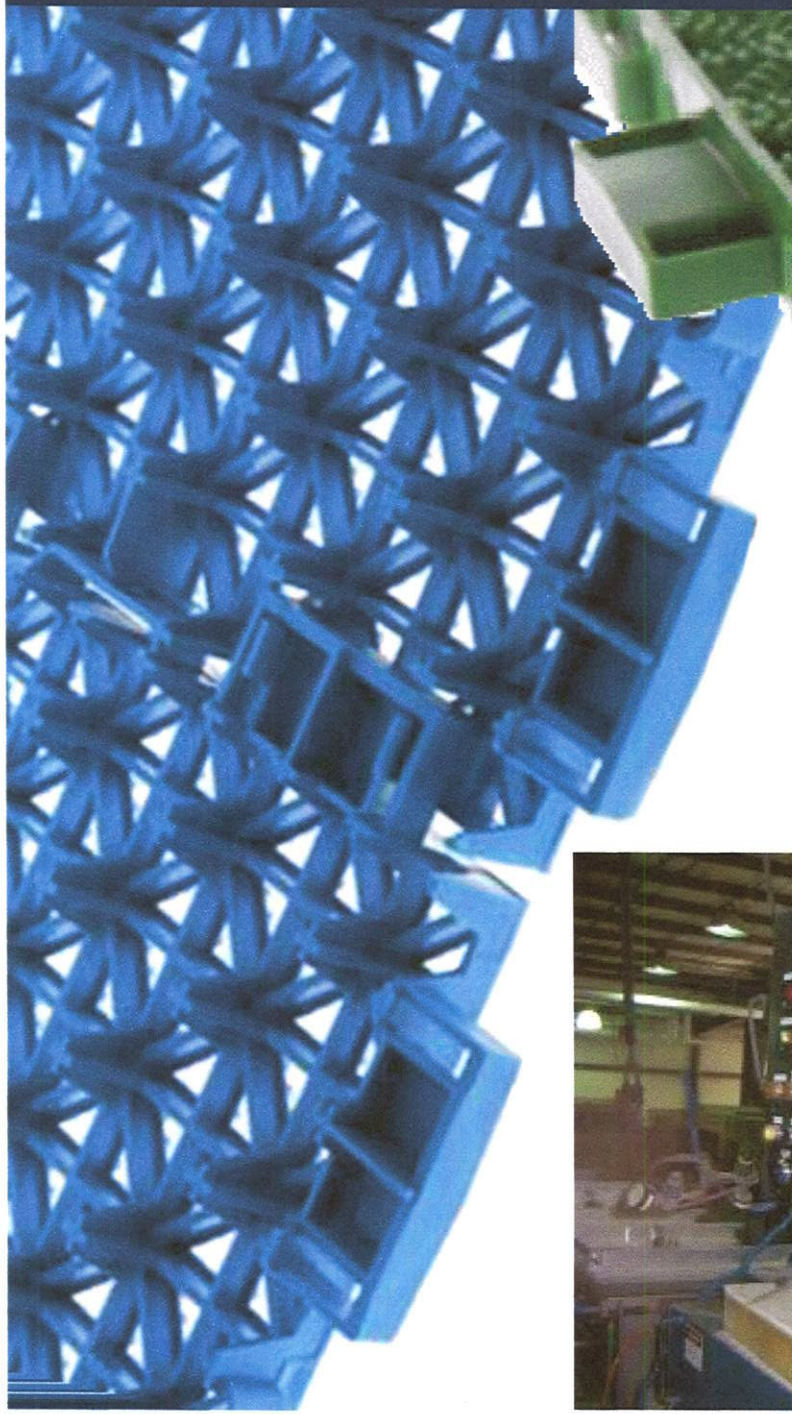
VERSACOURT

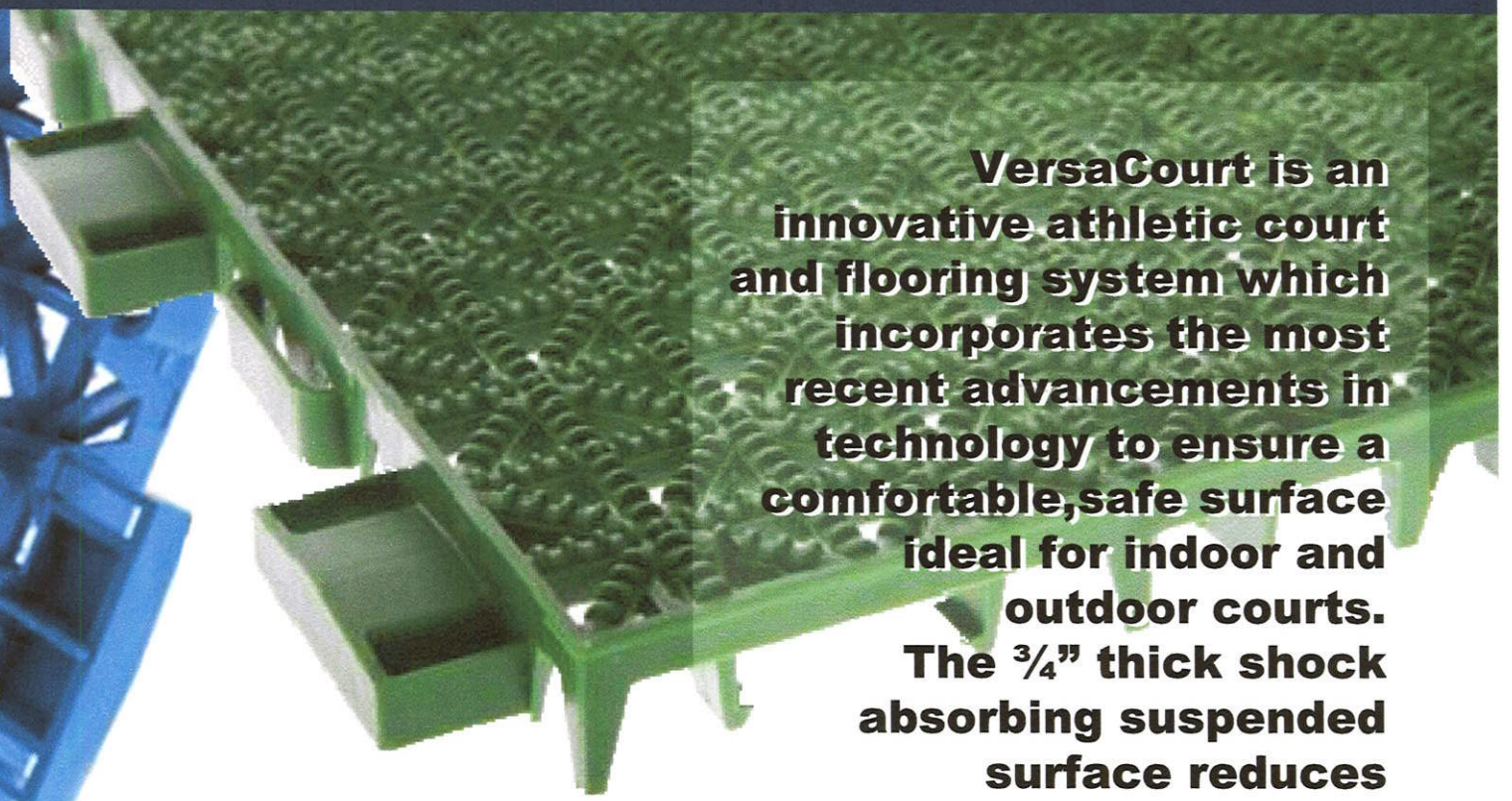
VersaCourt game courts are magnets for people of all ages providing many hours of healthy, enjoyable, interactive exercise. VersaCourt's custom designed indoor and outdoor courts incorporate the most recent advancements in engineering and manufacturing technology.

It's our drive for perfection that makes VersaCourt the best performing surface on the market today. Ideal for home and commercial applications, the sheer beauty and high-performance of our courts make it the right choice for all settings.



Cutting Edge Technology

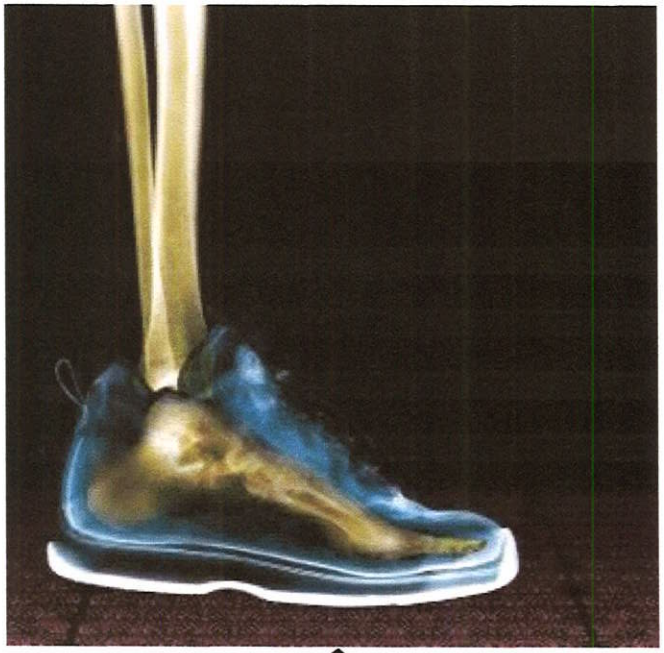


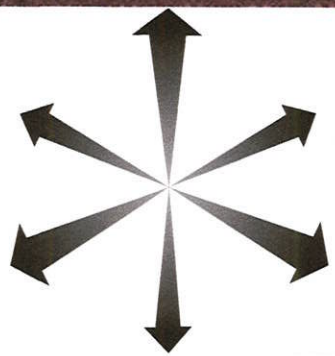


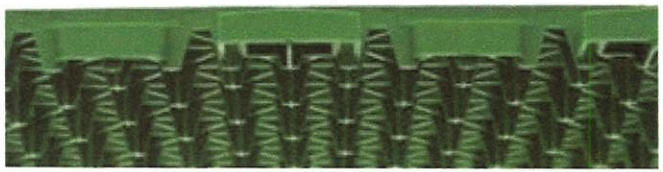
VersaCourt is an innovative athletic court and flooring system which incorporates the most recent advancements in technology to ensure a comfortable,safe surface ideal for indoor and outdoor courts. The ¾" thick shock absorbing suspended surface reduces playing fatigue, provides better ball rebound and exceptional game performance.

VERSACOURT™

VERSACOURT™







Awesome Physical Benefits

VersaCourt's unsurpassed physical benefits stem from its cutting edge tiles, which are 3/4" thick and feature multi-directional flex technology. The expansion joints & spring tabbing mechanism between the tiles allow slight side-to-side movement. VersaCourt's design also allows for a slight vertical give in the tile. The multi-directional flex features reduce fatigue and stress on joints, ligaments and lower back. This built-in flex action makes VersaCourt one of the safest and healthiest court surfaces on the market today. Orthopedic doctors have even installed VersaCourt for their own use just because of the reduction in stress on joints and ligaments and the prevention of sports injuries.

VERSACOURT™

The ultimate multi-use game court

A Virtual Family Magnet

Because of its sheer beauty,
high performance,
cool and comfortable playing surface,
the courts are magnets for people of
all ages, providing many hours of
healthy enjoyable exercise.

ENGINEERING CONSULTING SERVICES, LTD.
Geotechnical ◦ Construction Materials ◦ Environmental

July 26, 2001

Mr. Bob Personette
8800 Aquary Court
Springfield, Virginia 22153

ECS Job No. 7195

Reference: Report of Subsurface Exploration Services for Personette Tennis Courts, Springfield, Fairfax County, Virginia

Dear Mr. Personnette:

As authorized by your acceptance of our proposal No. 12588-GPR, Engineering Consulting Services, Ltd. has completed the subsurface exploration for the above referenced project. The subsurface exploration consisted of performing six hand augers at various locations around the two tennis courts in Springfield, Virginia. In conjunction with the hand augers Dynamic Cone Penetrometer Tests (DCP) were performed at various depths to determine the relative density of the in-place soils. This exploration was performed to determine the possible causes of the cracks of the existing pavement along the tennis courts. The approximate location of the exploration points are shown on the Boring Location Diagram provided in the Appendix.

Background

The above referenced site consists of two tennis courts as well as a basketball court off of Arley Drive in Springfield, Virginia. Upon initial observation of the tennis courts, cracking was evident throughout the pavement of the tennis court. Based on the existing site topography, fill was most likely placed for constructing the tennis courts. Based on the information provided to us, it is understood that the tennis court has received several overlays in recent years. However, the cracking of the tennis court continues to occur. In order to better evaluate the subsurface conditions, a series of six hand augers were performed.

Exploration Procedure

A hand auger probe consists of a four inch diameter hole drilled with a portable auger bucket. Each of the hand auger probes were extended to bucket refusal within the existing soil matrix. The soil samples recovered were visually classified in the field on the basis of texture and plasticity in accordance with the Unified Soil Classification System (USCS). The group symbols for each soil type are indicated in parenthesis following the soil description on the hand auger logs. A brief description of the USCS is included with this letter. The stratification lines designating the interfaces between earth materials on the hand auger logs and profiles are

approximate; in-situ, the transitions may be gradual. Hand auger results are include with this letter.

Additionally, Dynamic Cone Penetrometer (DCP) tests were performed in accordance with ASTM STP-399 at selected depths in each of the hand auger probes to evaluate the relative strength of the anticipated foundation bearing soils. The DCP tests consist of dropping a 15 pound weight over a distance of 20 inches. The number of blows required to advance the cone 1.75 inches, determines the DCP blow count. The blow counts can be empirically correlated to the Standard Penetration Test (SPT) and subsequently the bearing capacity and relative density can be evaluated for specific soil types. The results of the DCP testing are also included in the text of this report.

Laboratory Testing Program

Representative soil samples were selected and tested in our laboratory to check field classifications and to determine pertinent engineering properties. The laboratory testing program included visual classifications, moisture content tests, and Atterberg Limits. All data obtained from the laboratory tests are attached with this letter report.

An experienced soil engineer classified each soil sample on the basis of texture and plasticity in accordance with the Unified Soil Classification System. The group symbols for each soil type are indicated in parentheses following the soil descriptions on the tables in the following section.

The soil samples will be retained in our laboratory for a period of 60 days, after which, they will be discarded unless other instructions are received as to their disposition.

Results of Subsurface Exploration

The exploration points encountered approximately 4 to 5 inches of asphalt pavement followed by 3 to 5 inches of stone. Beneath the pavement and subbase material, existing fill soils were encountered to depths of 2 to 5 feet below the existing ground surface. The fill soils consisted of CLAY (CL, CH), and SAND and Asphalt fragments (GP, SP). Natural soils were encountered in only two of the hand augers and consisted of primarily Sandy CLAY and CLAY (CL, CH). In addition to the soils found in our hand augers, perched water was noted in the vicinity of Hand Auger No. 6 at a depth of approximately 3 feet. A graphical log of each of the hand augers is in the attached Appendix.

Engineering Recommendations

The presence of medium to highly plastic clay under the majority of the existing tennis court, indicates that the cracking is most likely a result of the high shrink-swell potential of the soils.

In addition, the presence of perched water underneath the tennis court is also a contributing factor.

Due to the presence of medium to highly plastic soils and the possibility of perched groundwater, we are recommending the following of two options. The first involves complete removal of the existing asphalt and gravel subbase followed by a 2-foot undercut of the existing soils and replacement with properly placed low plasticity, preferably granular engineered fill. The second involves only a limited undercut utilizing lime stabilization in the upper 1 foot of soils. Regardless of the alternative chosen we recommend the installation of a french drain system around the existing tennis court. Each of the two options are discussed in detail in subsequent paragraphs.

The first and most conservative of these options is to completely remove the existing asphalt and stone subbase. Following the removal, we recommend that 2 feet of existing soil, most notably the high plasticity clay, be undercut and removed. Following the removal we recommend the area be thoroughly proofrolled to identify any soft or unsuitable material. Proofrolling involves using a loaded dump truck, having an axle weight of at least 10 tons, over the exposed subgrade to identify any localized soft or unsuitable material which should be removed. Once a stable subgrade is achieved, fill should be placed in order to achieve the existing finished tennis court elevation. We recommend that fill used to support any of the proposed tennis court should be placed in lifts not exceeding 8 inches in loose thickness, moisture conditioned to within 2% of the optimum moisture content, and compacted to at least 95% of the dry density obtained from ASTM D-698, Standard Proctor Method. However, we recommend that the upper 1 foot be compacted to at least 100% of the aforementioned maximum dry density.

It is critical that any soil placed as fill should be of an approved material, free of organic matter or debris, be a non-frost susceptible soil, and have a liquid limit and plasticity index less than 40 and 15, respectively. The surficial soils encountered in our hand auger do not appear suitable for reuse as engineered fill. We recommend that SM or more granular soils be utilized for backfill and establishing the proposed subgrade.

As an alternative to a complete 2 foot undercut of the existing clay soils, we recommend the use of lime stabilization. Lime stabilization would involve the removal of the asphalt and stone subbase and applying hydrated lime to the upper 1 foot of the exposed subgrade. We recommend treating the subgrade soils to a depth of 1 foot with an estimated 4% to 6% hydrated lime. Following lime stabilization fill placement can proceed as detailed in the previous paragraph.

Regardless of either scenario chosen we recommend that a french drain be installed around the tennis court that will serve to drain water away from the tennis courts. A french detail is attached with this letter.

Pavement Considerations

Once the subgrade has been properly remediated or stabilized, replacement of the existing tennis court can begin. With the appropriate routine maintenance a new pavement section should have a serviceable lifespan of 20 years. We recommend that a minimum 2 inches of surface course asphalt in conjunction with a 4 inch subbase aggregate (21A) be used to restore the pavement section. In addition, geogrid reinforcement may be applicable underneath the subgrade aggregate. A geogrid reinforcing layer would serve to reduce the potential for differential settlement in areas of the court where some localized soft material may still exist. Tensar BX1100 geogrid is typically used in this application. If used, the geogrid should be placed in accordance with the manufacturer's recommendations. It should be noted that a final pavement design should be performed based on the CBR value of the final subgrade soils.

Closing

This report has been prepared for your use and for the use of other design professionals in design and construction planning for the proposed improvements to the existing tennis court in Springfield, Virginia. Any changes in the design or additional information regarding the history of the existing tennis court, should be brought to our attention in order to determine any affect on the recommendations presented in this report. We also recommend that we be given the opportunity to assist you in reviewing the prospective bids so that we can determine whether or not the contractors have properly interpreted the project requirements. Additionally, we recommend that you contact us prior to the construction phase, so that we can coordinate the field observations and testing during the execution of the proposed improvements.

We have enjoyed being of service to you. If you have any questions with regard to the information and recommendations presented in this report, or if we can be of further assistance, please do not hesitate to contact us.

Respectfully,

ENGINEERING CONSULTING SERVICES, LTD.

Chadd W. Yeatts, E.I.T.
Assistant Project Engineer

COMMONWEALTH OF VIRGINIA
MANOL ANDONYADIS
No. 18784
PROFESSIONAL ENGINEER

Manol P. Andonyadis, P.E.
Principal Engineer

CWY/pp I:/geotech/report/7195rse

APPENDIX

Unified Soil Classification System

Hand Auger Logs

Laboratory Test Results

French Drain Detail

Boring Location Diagram/Vicinity Map

PROJECT NAME: PERSONETTE TENNIS COURT		TEST PIT #: HA-1
CLIENT: BOB PERSONETTE	JOB #: 7195	SURFACE ELEVATION:
LOCATION: SPRINGFIELD, VA	ARCH./ENG:	

DEPTH (FT.)	ELEV. (FT.)	DESCRIPTION OF MATERIAL	EXCAV. EFFORT	DCP	QP	SAMPLE NO.	MOIST. CONT.
0		Brown, Moist, (CL-FILL)		10-9-9		1	
2		SAND and Asphalt Fragments, Brownish Black, Moist, (GP-SP) [FILL]				2	
		END OF TEST PIT @ 2.5'					
4							
6							
8							
10							
14							
18							
22							

REMARKS:
4.25" ASPHALT, 5" STONE

THE STRATIFICATION LINES REPRESENT THE APPROXIMATE BOUNDARY LINES BETWEEN SOIL TYPES, IN-SITU THE TRANSITION MAY BE GRADUAL

EXCAVATION EFFORT: E - EASY M - MEDIUM D - DIFFICULT VD - VERY DIFFICULT

CONTRACTOR:	OPERATOR:	ECS ENG'R: JJR
MAKE:	MODEL:	DATE: 7-3-01
REACH:	CAPACITY:	UNITS: English

ECS LTD

PROJECT NAME: PERSONETTE TENNIS COURT		TEST PIT #: HA-2
CLIENT: BOB PERSONETTE	JOB #: 7195	SURFACE ELEVATION:
LOCATION: SPRINGFIELD, VA	ARCH./ENG:	

DEPTH (FT.)	ELEV. (FT.)	DESCRIPTION OF MATERIAL	EXCAV. EFFORT	DCP	QP	SAMPLE NO.	MOIST. CONT.
0		Sandy CLAY, Trace Roots, Gray, Moist, (CL-FILL)					
		Sandy CLAY, Reddish Brown, Moist, (CH-FILL)		5-6-4		1	10.9%
2							
		Sandy CLAY, Grayish Brown, Moist, (CL-CH)		5-4-4		2	20.2%
4							
				8-9-7		3	23.4%
		END OF TEST PIT @ 5.0'					
6							
8							
10							
14							
18							
22							

REMARKS:
5" ASPHALT, 3" STONE

THE STRATIFICATION LINES REPRESENT THE APPROXIMATE BOUNDARY LINES BETWEEN SOIL TYPES, IN-SITU THE TRANSITION MAY BE GRADUAL

EXCAVATION EFFORT: E - EASY M - MEDIUM D - DIFFICULT VD - VERY DIFFICULT

CONTRACTOR:	OPERATOR:	ECS ENG'R: JJR
MAKE:	MODEL:	DATE: 7-3-01
REACH:	CAPACITY:	UNITS: English

ECS LTD

PROJECT NAME: PERSONETTE TENNIS COURT	TEST PIT #: HA-3
CLIENT: BOB PERSONETTE	JOB #: 7195
LOCATION: SPRINGFIELD, VA	ARCH./ENG:
SURFACE ELEVATION:	

DEPTH (FT.)	ELEV. (FT.)	DESCRIPTION OF MATERIAL	EXCAV. EFFORT	DCP	QP	SAMPLE NO.	MOIST. CONT.
0		CLAY, Grayish Brown, Moist, (CH-FILL)		4-5-5		1	18.1%
2		Sandy CLAY, Brown, Moist, (CL-FILL)		4-3-4		2	18.5%
4		CLAY, Trace Gravel, Reddish Brown, Moist, (CH-FILL)		5-7-5		3	22.7%
6		END OF TEST PIT @ 5.0'					
8							
10							
14							
18							
22							

REMARKS:
4.75" ASPHALT, 4.5" STONE

THE STRATIFICATION LINES REPRESENT THE APPROXIMATE BOUNDARY LINES BETWEEN SOIL TYPES, IN-SITU THE TRANSITION MAY BE GRADUAL

EXCAVATION EFFORT: E - EASY M - MEDIUM D - DIFFICULT VD - VERY DIFFICULT

CONTRACTOR:	OPERATOR:	ECS ENG'R: JJR
MAKE:	MODEL:	DATE: 7-3-01
REACH:	CAPACITY:	UNITS: English

ECS LTD

PROJECT NAME: PERSONETTE TENNIS COURT	TEST PIT #: HA-4
CLIENT: BOB PERSONETTE	JOB #: 7195
LOCATION: SPRINGFIELD, VA	ARCH./ENG:
	SURFACE ELEVATION:

DEPTH (FT.)	ELEV. (FT.)	DESCRIPTION OF MATERIAL	EXCAV. EFFORT	DCP	QP	SAMPLE NO.	MOIST. CONT.
0		Clayey SAND, Brown, Moist, (SC-FILL)		7-7-5		1	11.6%
2		Sandy CLAY, Brown to Red, Moist, (CL)		4-5-6		2	24.5%
4							
6		END OF TEST PIT @ 5.0'		3-3-4		3	19.0%
8							
10							
14							
18							
22							

REMARKS:
4.75" ASPHALT, 5" STONE

THE STRATIFICATION LINES REPRESENT THE APPROXIMATE BOUNDARY LINES BETWEEN SOIL TYPES, IN-SITU THE TRANSITION MAY BE GRADUAL

EXCAVATION EFFORT: E - EASY M - MEDIUM D - DIFFICULT VD - VERY DIFFICULT

CONTRACTOR:	OPERATOR:	ECS ENG'R: JJR
AKE:	MODEL:	DATE: 7-3-01
REACH:	CAPACITY:	UNITS: English

ECS LTD

PROJECT NAME: PERSONETTE TENNIS COURT		TEST PIT #: HA-5
CLIENT: BOB PERSONETTE	JOB #: 7195	SURFACE ELEVATION:
LOCATION: SPRINGFIELD, VA	ARCH./ENG:	

DEPTH (FT.)	ELEV. (FT.)	DESCRIPTION OF MATERIAL	EXCAV. EFFORT	DCP	QP	SAMPLE NO.	MOIST. CONT.
0		Sandy CLAY, Brown, Moist, (CL-CH) [FILL]		4-4-4		1	
2		CLAY, Reddish Brown, Moist, (CH-Poss. FILL)		5-4-4		2	16.5%
4		END OF TEST PIT @ 5.0'		7-7-5		3	
6							
8							
10							
14							
18							
22							

REMARKS:
4.25" ASPHALT, 4" STONE

THE STRATIFICATION LINES REPRESENT THE APPROXIMATE BOUNDARY LINES BETWEEN SOIL TYPES, IN-SITU THE TRANSITION MAY BE GRADUAL

EXCAVATION EFFORT: E - EASY M - MEDIUM D - DIFFICULT VD - VERY DIFFICULT

CONTRACTOR:	OPERATOR:	ECS ENG'R: JJR
MAKE:	MODEL:	DATE: 7-3-01
REACH:	CAPACITY:	UNITS: English

ECS LTD

PROJECT NAME:		TEST PIT #:
PERSONETTE TENNIS COURT		HA-6
CLIENT: BOB PERSONETTE	JOB #: 7195	SURFACE ELEVATION:
LOCATION: SPRINGFIELD, VA	ARCH./ENG:	

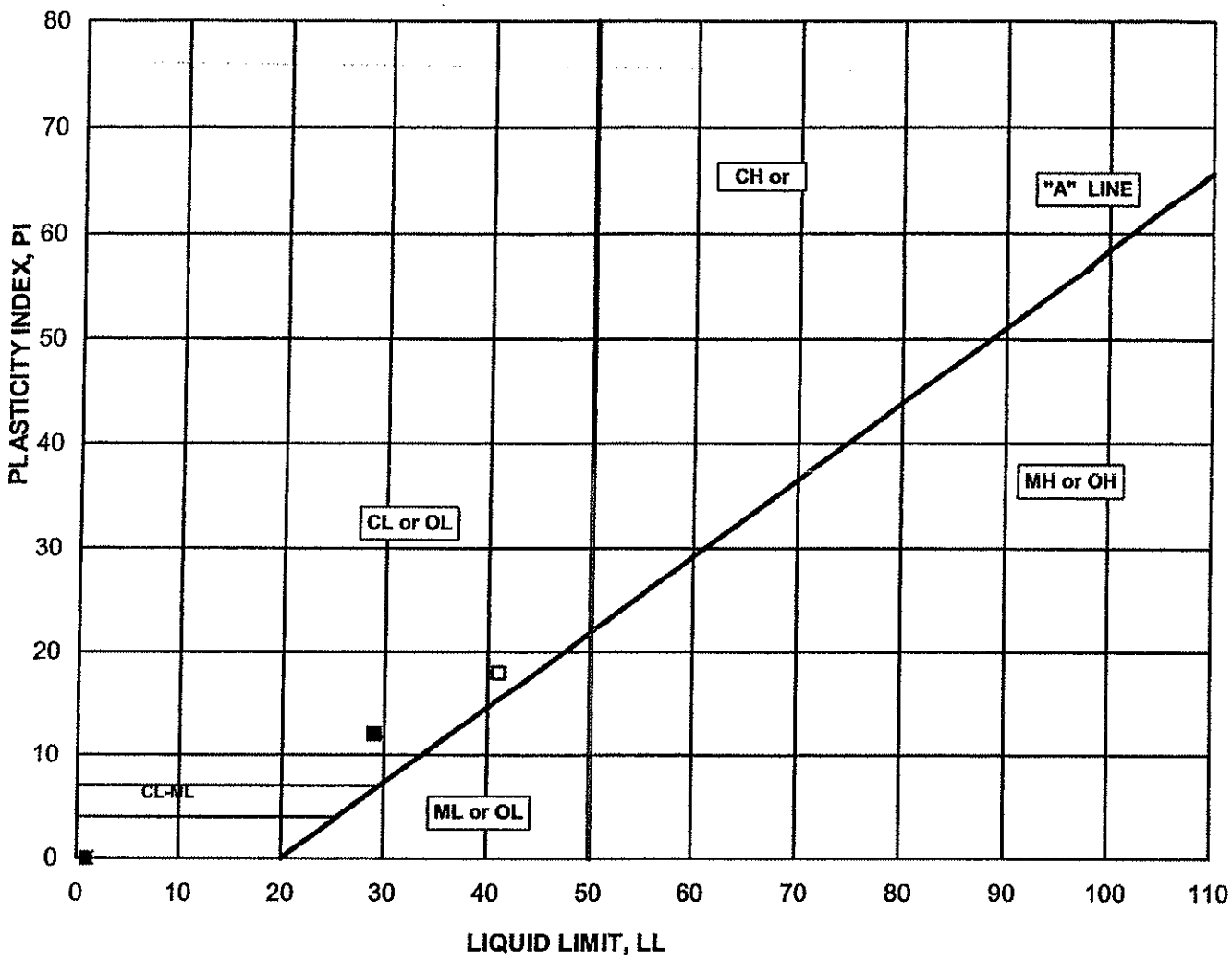
DEPTH (FT.)	ELEV. (FT.)	DESCRIPTION OF MATERIAL	EXCAV. EFFORT	DCP	QP	SAMPLE NO.	MOIST. CONT.
0		CLAY, Grayish Brown, Moist, (CH-FILL)					
				6-7-6		1	
2							
				4-4-3		2	
		BUCKET REFUSAL @ 3.0'					
4							
6							
8							
10							
14							
18							
22							

REMARKS:
4" ASPHALT, 4" STONE WATER ENCOUNTERED AT 3'

THE STRATIFICATION LINES REPRESENT THE APPROXIMATE BOUNDARY LINES BETWEEN SOIL TYPES, IN-SITU THE TRANSITION MAY BE GRADUAL

EXCAVATION EFFORT: E - EASY M - MEDIUM D - DIFFICULT VD - VERY DIFFICULT

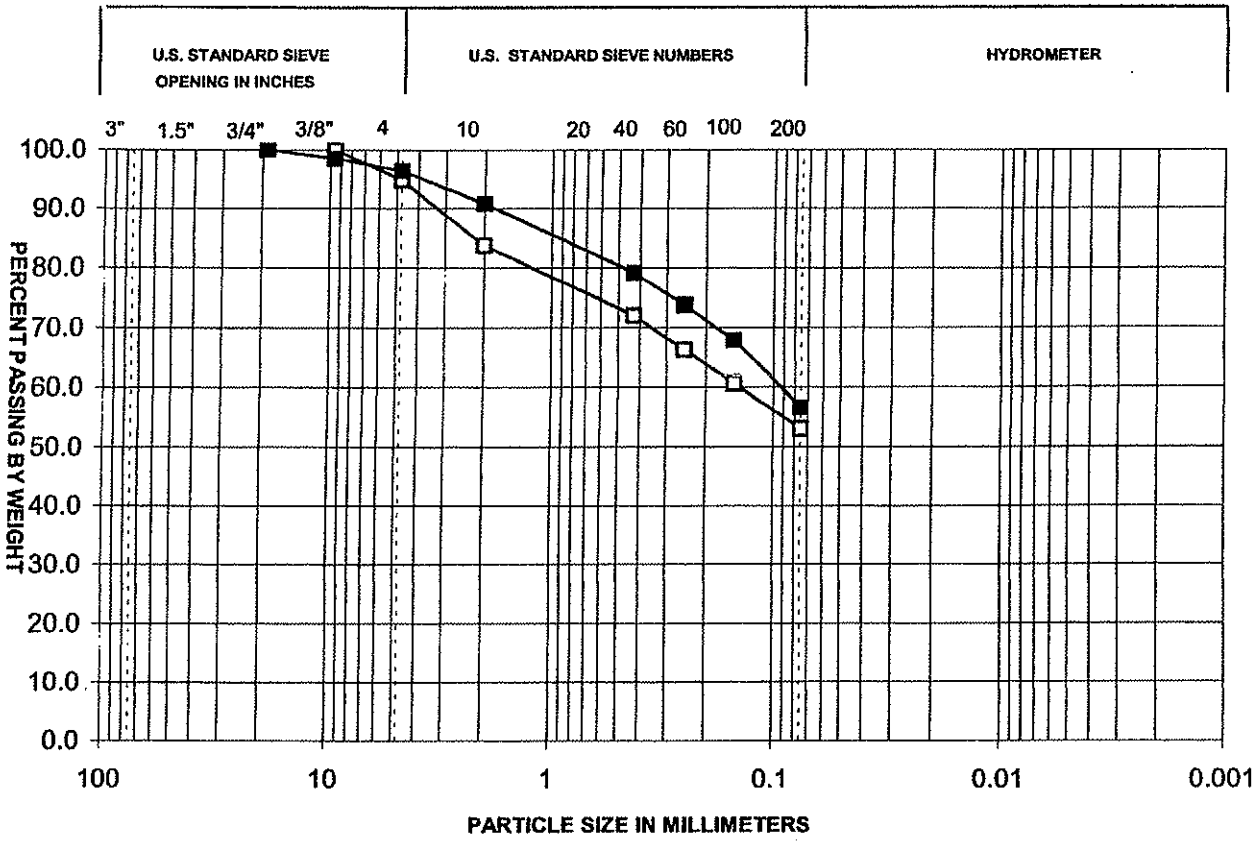
CONTRACTOR:	OPERATOR:	ECS ENG'R: JJR
MAKE:	MODEL:	DATE: 7-3-01
REACH:	CAPACITY:	UNITS: English



BORING/ SAMPLE No.	DEPTH (feet)	TEST SYMBOL	DESCRIPTION	WATER CONTENT (%)	LL	PL	PI
HA-2 / S-2	35"	□	SandyLeanClayTr/Mica(CL)L/YllwishBr	20.2	41	23	18
HA-3 / S-1	12"	■	SandyLeanClayTr/Mica(CL)Olive	18.1	29	17	12
/		△			-	-	-
/		▲			-	-	-
/		X			-	-	-
/		○			-	-	-
/		●			-	-	-
/		◇			-	-	-
/		◆			-	-	-
/		+			-	-	-
		X					

Project: Personnette Tennis Court	Engineering Consulting Services Ltd.
Project No.: 7195	Chantilly, Virginia
Date: Jul 23,2001	Plasticity Chart

COBBLE	GRAVEL		SAND			SILT OR CLAY
		FINE	COARSE		FINE	



Boring/ Sample No.	Depth (feet)	Symbol	LL	PI	Description
HA2 / 2	35"	□	41	18	Sandy Lean Clay Tr/Mica(CL)L/Yellowish Brown
HA3 / 1	12"	■	29	12	Sandy Lean Clay Tr/Mica(CL) Olive
/		△			
/		▲			

Project: Personnette Tennis Court

Project No.: 7195

Date: 7/24/01

Engineering Consulting Services, Ltd

Chantilly, Virginia

Grain Size Analysis

Engineering Consulting Services, Ltd.

Chantilly, Virginia

Laboratory Testing Summary

Project Number: 7195 **Project Name:** Personnette Tennis Court **Date:** 7/24/01

Project Engineer: CWY **Principal Engineer:** MPA **Summary By:** HNT

Boring Number	Sample Number	Depth (feet)	Moisture Content (%)	USCS	Liquid Limit	Plastic Limit	Plasticity Index	Percent Passing No. 200 Sieve	Compaction		CBR Value	Other
									Maximum Density (pcf)	Optimum Moisture (%)		
HA-2	S-2	35"	20.2	CL	41	23	18	53.0				
HA-3	S-1	12"	18.1	CL	29	17	12	56.6				
HA-3	S-3	60"	22.7									
HA-2	S-1	12"	10.9									
HA-2	S-3	60"	23.4									
HA-3	S-2	36"	18.5									
HA-4	S-1	14"	11.6									
HA-4	S-2	38"	24.5									
HA-4	S-3	64"	19.0									
HA-5	S-2	36"	16.5									

Summary Key:

SA = See Attached
S = Standard Proctor
M= Modified Proctor
V = Virginia Test Method
OC = Organic Content

Hyd = Hydrometer
Con = Consolidation
DS = Direct Shear
GS = Specific Gravity

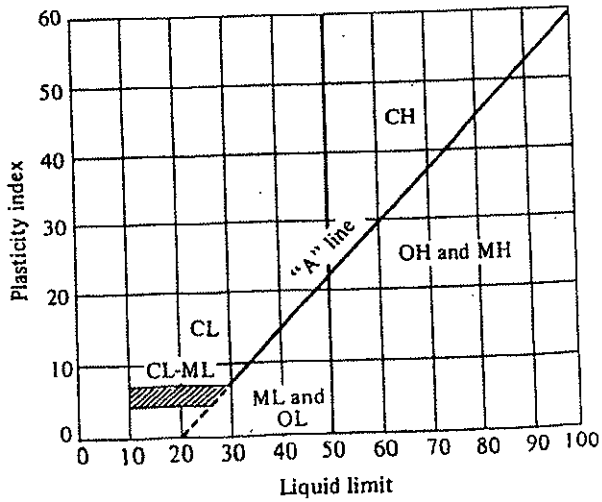
UCS = Unconfined Compression Soil
UCR = Unconfined Compression Rock
LS = Lime Stabilization
CS = Cement Staibilization

Unified Soil Classification System (ASTM D-2487)

Major Divisions			Group Symbols	Typical Names	Laboratory Classification Criteria
Coarse-grained soils (More than half of material is larger than No. 200 sieve size)	Gravels (More than half of coarse fraction is larger than No. 4 sieve size)	Clean gravels (Little or no fines)	GW	Well-graded gravels, gravel-sand mixtures, little or no fines	$C_U = \frac{D_{60}}{D_{10}}$ greater than 4; $C_C = \frac{(D_{30})^2}{D_{10} \times D_{60}}$ between 1 and 3
			GP	Poorly graded gravels, gravel-sand mixtures, little or no fines	Not meeting all gradation requirements for GW
		Gravels with fines (Appreciable amount of fines)	GM[a] d, u	Silty gravels, gravel-sand-silt mixtures	Atterberg limits below "A" line or P.I. less than 4; Above "A" line with P.I. between 4 and 7 are *borderline* cases requiring use of dual symbols
			GC	Clayey gravels, gravel-sand-clay mixtures	Atterberg limits below "A" line with P.I. greater than 7
	Sands (More than half of coarse fraction is smaller than No. 4 sieve size)	Clean sands (Little or no fines)	SW	Well-graded sands, gravelly sands, little or no fines	$C_U = \frac{D_{60}}{D_{10}}$ greater than 6; $C_C = \frac{(D_{30})^2}{D_{10} \times D_{60}}$ between 1 and 3
			SP	Poorly graded sands, gravelly sands, little or no fines	Not meeting all gradation requirements for SW
		Sands with fines (Appreciable amount of fines)	SM[a] d, u	Silty sands, sand-silt mixtures	Atterberg limits above "A" line or P.I. less than 4; Limits plotting in hatched zone with P.I. between 4 and 7 are *borderline* cases requiring use of dual symbols
			SC	Clayey sands, sand-clay mixtures	Atterberg limits above "A" line with P.I. greater than 7
Fine-grained soils (More than half material is smaller than No. 200 sieve)	Silts and clays (Liquid limit less than 50)		ML	Inorganic silts and very fine sands, rock flour, silty or clayey fine sands, or clayey silts with slight plasticity	
			CL	Inorganic clays of low to medium plasticity, gravelly clays, sandy clays, silty clays, lean clays	
			OL	Organic silts and organic silty clays of low plasticity	
	Silts and clays (Liquid limit greater than 50)		MH	Inorganic silts, micaceous or diatomaceous fine sandy or silty soils, elastic silts	
			CH	Inorganic clays of high plasticity, fat clays	
			OH	Organic clays of medium to high plasticity, organic silts	
	Highly organic soils		Pt	Peat and other highly organic soils	

Determine percentages of sand and gravel from grain-size curve. Depending on percentage of fines (fraction smaller than No. 200 sieve size), coarse-grained soils are classified as follows:
Less than 5 per cent — GW, GP, SW, SP
More than 12 per cent — GM, GC, SM, SC
5 to 12 per cent — *Borderline* cases requiring dual symbols[b]

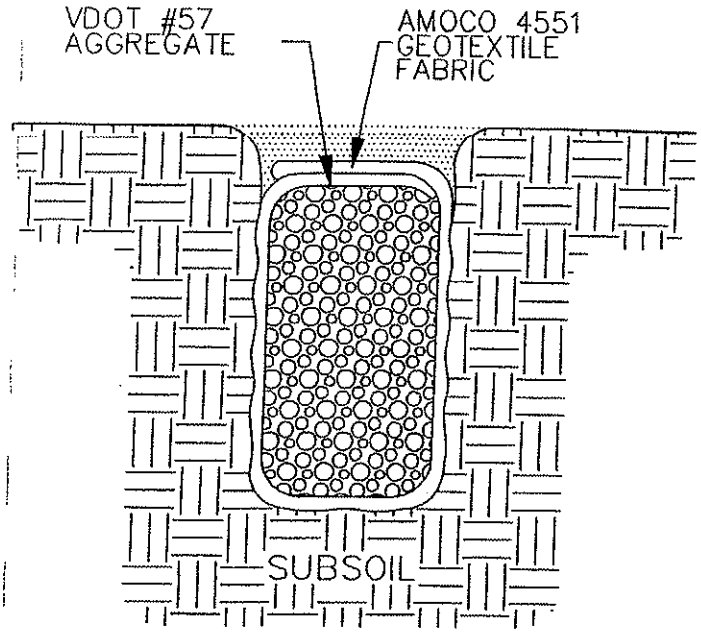
Plasticity Chart



[a]Division of GM and SM groups into subdivisions of d and u are for roads and airfields only. Subdivision is based on Atterberg limits; suffix d used when L.L. is 28 or less and the P.I. is 6 or less; the suffix u used when L.L. is greater than 28.
[b]Borderline classifications, used for soils possessing characteristics of two groups, are designated by combinations of group symbols. For example: GW-GC, well-graded gravel-sand mixture with clay binder.

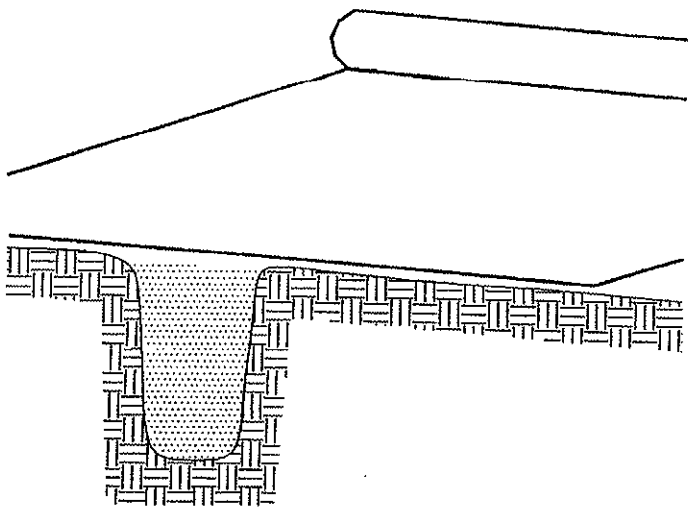
From Winterkorn and Fang, 1975

FINAL CONFIGURATION



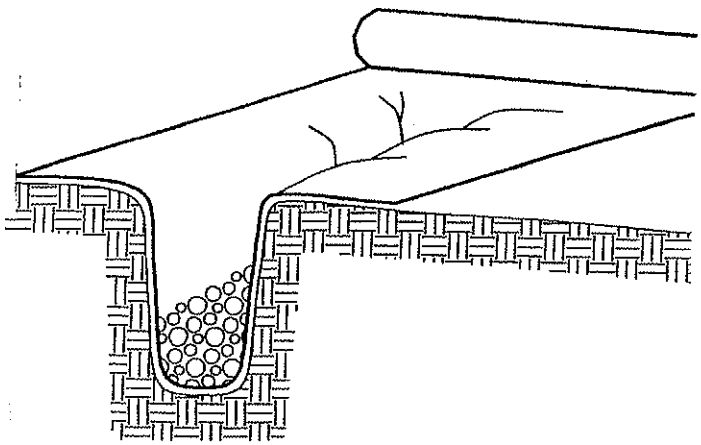
SUBDRAIN USING FILTER FABRIC

STEP 1



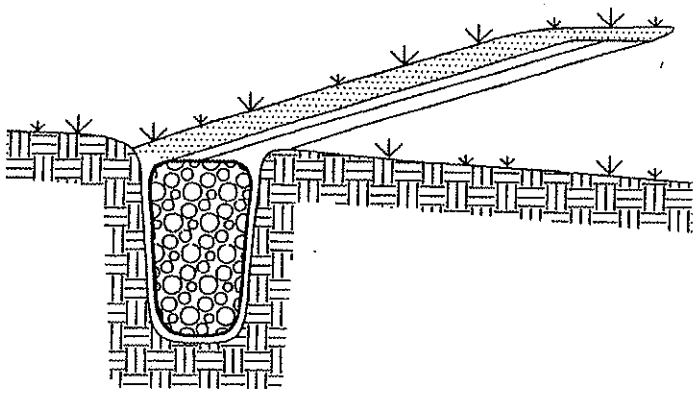
FABRIC IS UNROLLED
DIRECTLY OVER TRENCH

STEP 2



THE TRENCH IS FILLED WITH AGGREGATE

STEP 3



THE FABRIC IS LAPPED CLOSED
AND COVERED WITH CLAY
SOIL COMPACTED

DRAIN INSTALLATION PROCEDURE

(NTS)