



VANDERBURGH COUNTY ENGINEERING DEPARTMENT

201 Northwest Fourth Street • Suite 306
Old Vanderburgh County Courthouse
Evansville, IN 47708-1358
Phone (812) 435-5773
Fax (812) 435-5676

September 26, 2013

Mr. Brian Murphy
New Urban Investments LLC
5716 Hogue Rd
Evansville, IN 47712

Dear Mr. Murphy:

Based on an inspection that was completed on September 11, 2013 in Chadwick Place subdivision, the items that need to be addressed currently include the following:

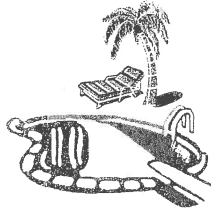
1. The drainage swale behind lot #32 does not appear to have an adequate slope that would force storm water to reach area drain #503. As a result, the water is being diverted out of the swale and has created an area of erosion behind lot #32 where the water runs off to the creek to the east. The swale also does not have the 3:1 side slopes as shown on the approved drainage plans. A concrete ribbon might solve this problem to allow water to get to the area drain and not cause more erosion to the creek.
2. The drainage swale from lots #11 thru #26 was not constructed according to the approved drainage plans. The swale cross section does not match the requirements of the approved plans. There are several fences encroaching in the easement for this swale. There are also decorative bricks placed at the bottom of the fence at 15212 AJ Drive possibly to block the flow through their yard. Also since the swale was not built here it appears water may be forced into Poet Square instead of being contained inside the Chadwick Place easement as required by the approved drainage plans. The drainage easement is only 5' wide in Poet Square, so there is not sufficient easement width in that subdivision to accommodate moving the swale into Poet Square.
3. Ensure that all swales are constructed according to the approved drainage plans after construction is completed on existing empty lots.

Once these items have been addressed, please contact me so that another inspection can be completed.

Sincerely,

John Stoll, P.E.
Vanderburgh County Engineer

cc: Jeff Mueller, Vanderburgh County Surveyor



www.ftkelleyandsons.com

F. T. KELLEY & SONS

2919 Broadway Ave.
Evansville, IN 47712
(812) 425-6058

3501 Interstate Dr.
Evansville, IN 47715
(812) 477-POOL

The following documentation is hereby submitted by F.T. Kelley & Sons Incorporated on behalf of Steve and Penny Garrett of 15341 AJ Dr. located in lot 39 of the Chadwick subdivision for permission to relax the 35' drainage easement located in the homeowners' back yard in order to install an in-ground swimming pool.

Said pool will be constructed using steel walls with a backfill material consisting of #11 white rock for adequate drainage of groundwater or inundation of heavy rain. There will be a 4" perimeter drain around the structure (please see side cut-away drawing in exhibit C) for which ground and rain water may flow away from the structure and into the easement. This perimeter drain is NOT to be used for wasting or backwashing water into the easement. Only water runoff will escape through the pipe. The pipe will terminate into the lowest point of the drainage easement roughly 3'-6' beyond the concrete deck on the east side of the pool.

For any questions, concerns, of clarification needed for this submission, please contact Jacob R. Kelley of F.T. Kelley & Sons at telephone number: (812) 305-0960. It is our earnest effort to cooperate in any way necessary in order to keep the process as streamlined and transparent as possible.

Thank you for your consideration,

Jacob R. Kelley

Site Manager

DRAINAGE EASEMENT ENCROACHMENT AGREEMENT

THIS AGREEMENT entered into as of the 3 day of May, 2013,
between Steve W and Penny L Garrett, ("Owner"),
whose mailing address is 15341 A J Drive, Evansville,
Indiana 47725
with notices sent to N/A,
Attn: N/A; and VANDERBURGH COUNTY,
INDIANA, by and through the Vanderburgh County Drainage Board ("County"),

WITNESSETH, That:

FOR AND IN CONSIDERATION of the sum of Ten Dollars (\$10.00), in hand paid, the receipt and sufficiency of which is hereby acknowledged and the mutual promises contained herein, the parties agree as follows:

1. Owner is the fee simple owner of the real estate ("Real Estate") situated in Vanderburgh County, Indiana, more particularly described on **Exhibit A**, attached hereto and adopted by reference herein. Owner agrees that it will not convey the property shown on **Exhibit A** until this instrument is recorded in the Office of the Vanderburgh County Recorder.
2. A recorded drainage easement ("Easement") exists on the Real Estate, as shown on **Exhibit B**, attached hereto and adopted by reference herein.
3. In order to develop the Real Estate, Owner desires to encroach on the Easement with certain improvements and construction ("Construction"), more particularly described and shown on **Exhibit C**, attached hereto and adopted by reference herein.
4. The Construction shall be undertaken, completed and at all times maintained by Owner in a good and workmanlike manner, using sound engineering, construction and maintenance techniques and practices, strictly as described herein and in the location shown herein, and so as not to impede, impair, obstruct, damage or interfere with surface water drainage or drainage facilities within and along the Easement or the use of the Easement for public utility purposes. Owner shall apply for and obtain, at its sole cost and expense, all necessary federal, state and/or local permits necessary to commence the Construction.

5. Owner, its successors and assigns, agree to indemnify, defend and hold harmless Vanderburgh County, its Drainage Board and its Members, employees, agents and assigns for any liability which may be incurred by them as a result of the approval, preparation and execution of this AGREEMENT, and the subsequent design, construction, use and maintenance by Owner, its successors and assigns, or County of the encroachment area described in **Exhibit C** and any pipes or structures installed or to be installed in the drainage easement. County expressly reserves the right to require Owner, at its sole cost and expense, to remove the Construction, upon thirty (30) days written notice to Owner at its address in the event County determines that the Construction either: (1) has not been constructed or maintained strictly in accordance with this Agreement; (2) is impeding, impairing, obstructing, damaging or interfering with surface water drainage or drainage facilities within and along the Easement; or (3) is so interfering with the use of the Easement for public utility purposes. In the event Owner fails to comply with County's notice and direction in a timely manner, County may remove the Construction at Owner's sole cost and expense.
6. Owner, its successors and assigns, shall cause County to be named as an additional-named insured on Owner's public liability insurance policy, applicable to the Real Estate at all times during the term of this Agreement, and to furnish County with a certificate of insurance evidencing adequate coverage containing a thirty (30) day notice-of-cancellation clause.
7. This Agreement shall remain in effect for the duration of the encroachment unless sooner terminated by the County, upon thirty (30) days written notice to Owner at its address due to the failure of Owner to comply with any provision hereof. The provisions of this Agreement shall be deemed covenants running with the title to the Real Estate and shall be binding on and inure to the benefit of the parties and their respective successors and assigns.

IN WITNESS WHEREOF, the parties have executed this Agreement as of the date first written above.

OWNER: Steve W and Penny L Garrett

By:   (Signature)

Steve Garrett Penny Garrett (Printed or typed name)

Its: _____ (Title)

VANDERBURGH COUNTY, INDIANA

By: Vanderburgh County Drainage Board

By: _____ President, Vanderburgh County Drainage Board.

By: _____ Vice-President, Vanderburgh County Drainage Board

By: _____ Member, Vanderburgh County Drainage Board

ATTEST:

Vanderburgh County Auditor

APPROVED AS TO LEGAL FORM:

Vanderburgh County Attorney

ACKNOWLEDGMENTS

STATE OF Indiana)

COUNTY OF Vanderburgh) SS:

Before me, the undersigned, a Notary Public, within and for said county and state, personally appeared Steve W and Penny L Garrett, to me personally known as the owner of 15341 AJ Drive, a/an N/A corporation, and also known to me as the person whose name is affixed to the foregoing instrument, this day in person and acknowledged his/her signing, sealing and delivering of said instrument as the free and voluntary act of said corporation for the consideration and purposes therein set forth, and that he/she was duly authorized to execute same by the board of directors of said corporation.

WITNESS MY HAND AND SEAL, this 3 day of May, 2013.

Leah M. Henderson
Signature of Notary

Leah M. Henderson
Printed name of Notary

Vanderburgh
Notary's County of Residence

June 6, 2020
Expiration Date of Notary's Commission



LEAH M. HENDERSON
Resident of Vanderburgh County, IN
Commission Expires: June 6, 2020

STATE OF INDIANA)

) SS:

COUNTY OF VANDERBURGH)

Before me, a Notary Public, personally appeared the members of the **Vanderburgh County Drainage Board**, and also known to me as the persons whose names are affixed to the foregoing instrument, this day in person and acknowledged their signing, sealing and delivering of said instrument as the free and voluntary act of the Vanderburgh County Drainage Board on behalf of Vanderburgh County, Indiana, for the consideration and purposes therein set forth, and that they were duly authorized to execute same by law.

WITNESS MY HAND AND SEAL, this _____ day of _____, 20 ____.

Signature of Notary

Printed name of Notary

Notary's County of Residence

Expiration Date of Notary's Commission

The foregoing form of instrument prepared by Ted C. Ziemer, Jr., County Attorney, 20 N.W. 1st Street, Evansville, IN 47708, (812) 424-7575, and modified by the preparation and insertion of the incorporated **Exhibits A, B, and C** by _____, Owner's duly authorized agent, _____.

I affirm, under the penalties for perjury, that I have taken reasonable care to redact each Social Security Number in this document, unless required by law.



Signature of Declarant

Kati Mangold

Printed Name of Declarant

EXHIBIT "A"

(LEGAL DESCRIPTION 15341 A J Drive, Evansville, Indiana 47725)

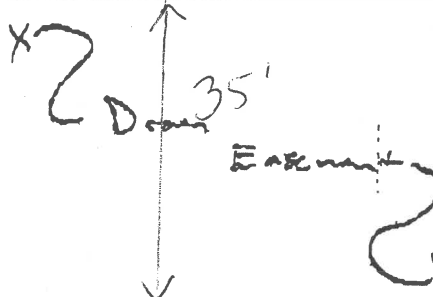
15341 A J Drive:

Kingsmont Subdivision Section III; Chadwick Place Subdivision; Lot Thirty Nine (39),
recorded in Plat Book R, Page 65; N 00 14'49" W 745.86'

Reference To Deed Number: 2011R00019351

EXHIBIT
B

6' P.U.E



35' D.E.

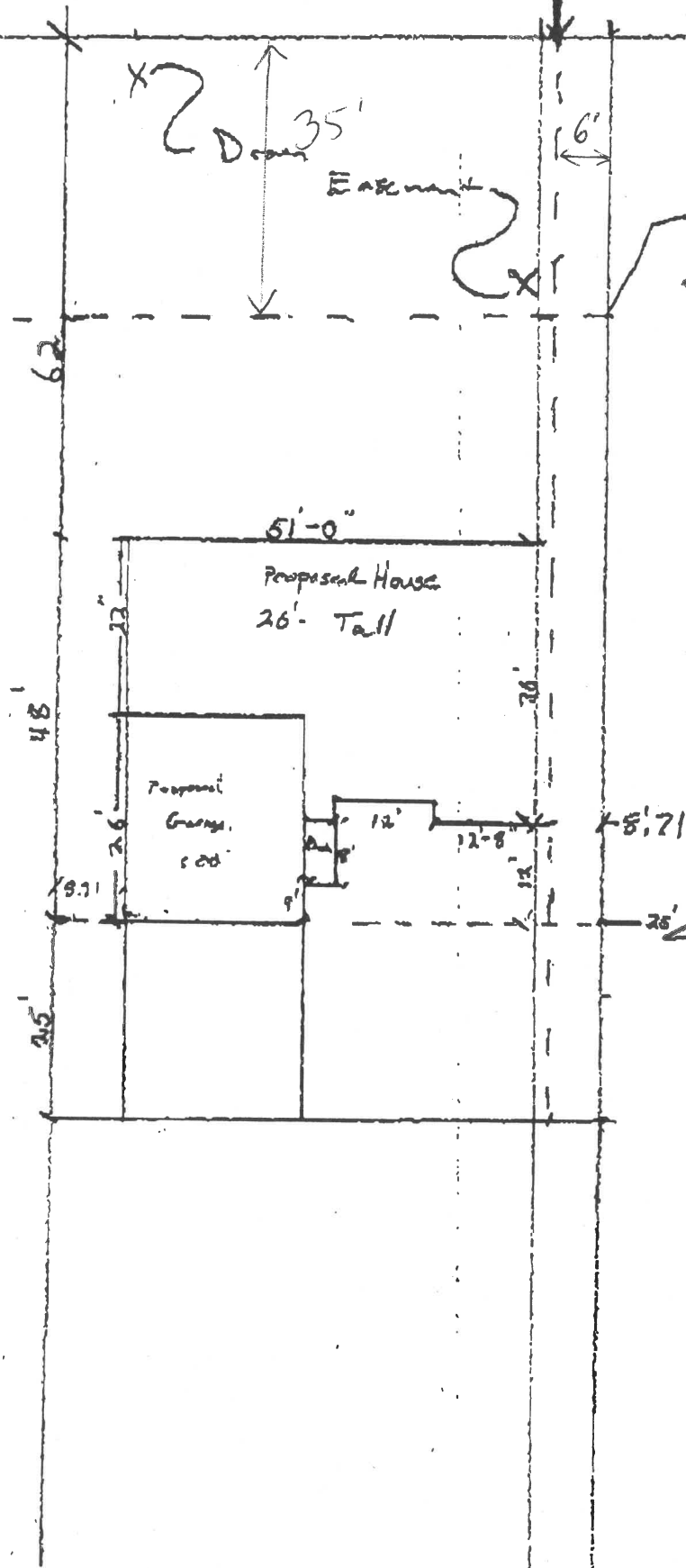
15341 A S Dr.

Lot 39 Chadwick

New Urban Homes

Brian Murphy

812.499.8303



[Handwritten signature]

Mar 20, 2011

EXHIBIT
C1

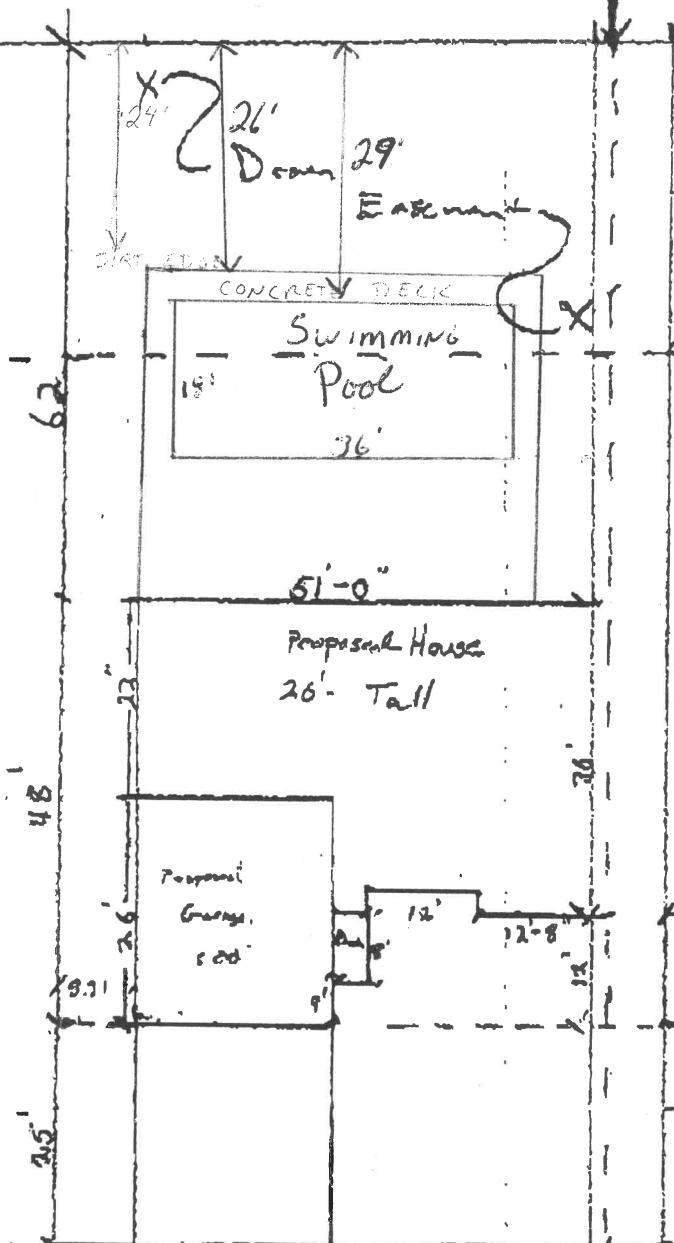
Exhibit C:

We are requesting a relaxation of the 35' drainage easement in order to construct an 18'x36' swimming pool in the back of the property. The pool will be centered with the house and extend 15' from the house to the east. The roughly 18" of fall to the yard over the 36' length of the pool will be kept at house level and then feathered and graded back into the easement with roughly 2' of fall over 2' extended from the concrete decking toward the east. A 4" corrugated perforated perimeter drain will encircle the pool and will terminate out into the easement. The exact location is to be determined at the time of construction on how the ground ultimately lays. However, it will extend no more than 3' from the edge of the concrete decking. This drain is not a backwash drain, and the only collection of water to pass through it will be from heavy rains or any welling of ground water around the structure.

In order to fit the pool in the yard to these specifications, we are asking for a relaxation of 11' of the 35' drainage easement for the construction of the structure with and understanding that we will be feathering a small retaining berm back from the concrete edge falling roughly 2' over 2' in order to dress up the structure and to not interfere with the function of the drainage easement.

C2

6' P.O.E



35' D.E.
 *15341 A S Dr.
 Lot 39 Chadwick
 New Urban Homes
 Brian Murphy
 812.499.8303

[Handwritten signature]
 Mar 20, 2011

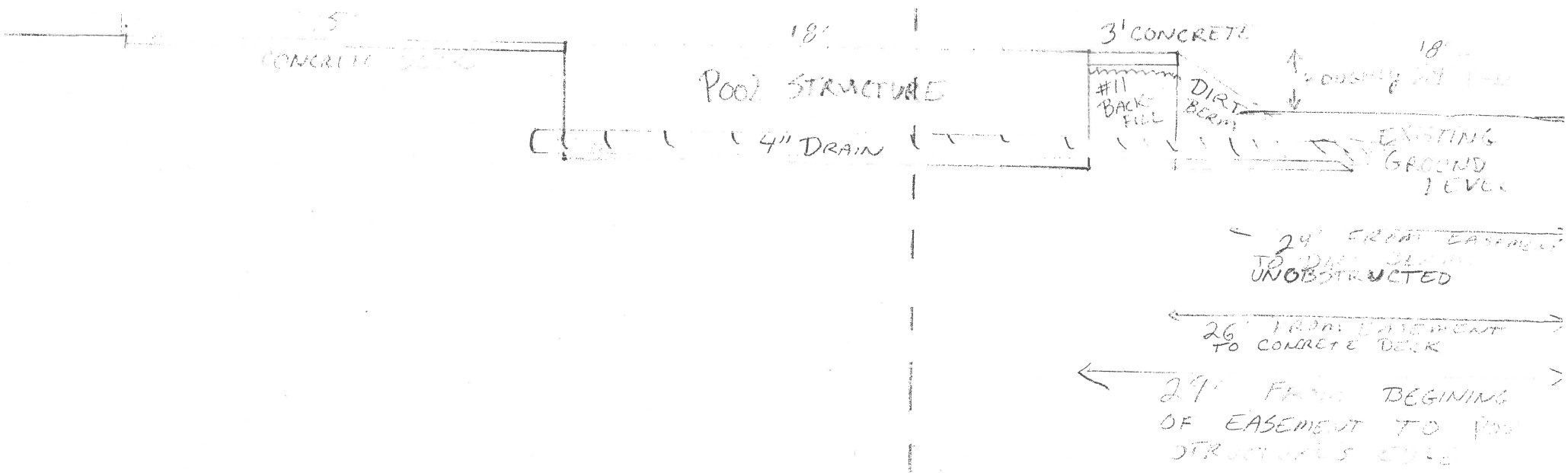
*TERMINATION OF
 DRAW TO THE
 AT TIME

53 A-26
187 29 CHADWICK

C3

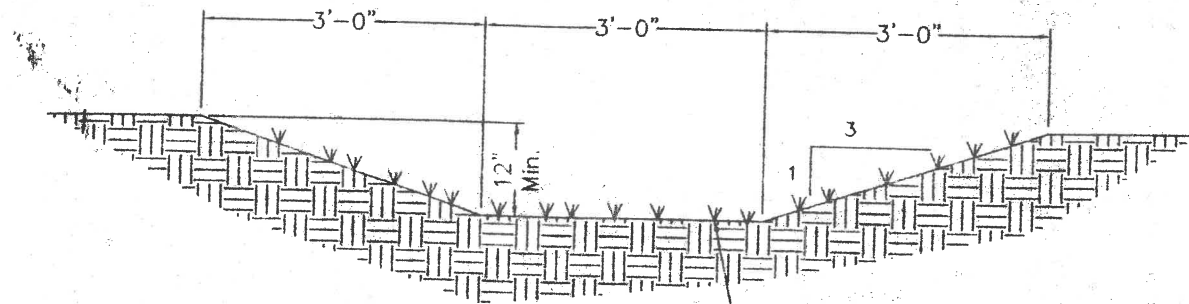
HOUSE

EXISTING 35'
DRAINAGE EASEMENT
TERMINATION INTO
HOME OWNERS YARD



Q (CFS) ? 6.15
 B (FT) ? 3
 M (FT/FT) ? 3
 S (FT/FT) ? 0.0243
 N (FT^{1/6}) ? 0.035

RESULTS
 Y= 0.45 FT
 A= 1.94 SF
 P= 5.82 FT
 V= 3.18 FPS
 F= 0.96
 SUB-CRITICAL FLOW



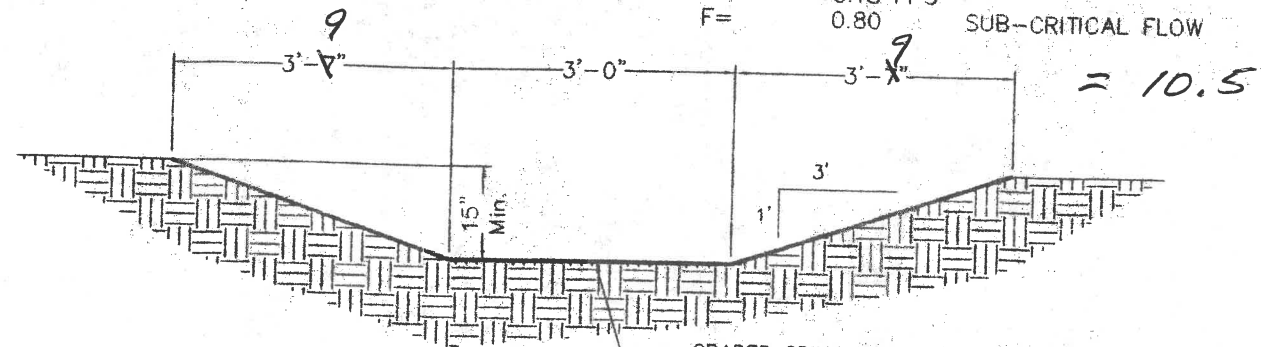
SLOPE OF SWALE TO BE 1.00% WITH
 2' WIDE BOTTOM AND 3:1 SIDE SLOPES
 - PROVIDE N.A.G. EROSION MAT S75
 WITH STAPLE PATTERN "D"

TYPICAL REAR YARD SWALE

TYPICAL DRAINAGE SWALE - LOT 10-26

Q (CFS) ? 11.03
 B (FT) ? 3
 M (FT/FT) ? 3
 S (FT/FT) ? 0.0153
 N (FT^{1/6}) ? 0.035

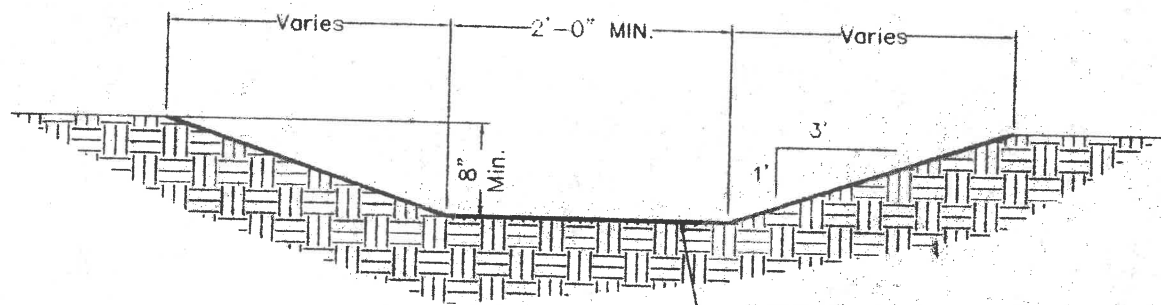
RESULTS
 Y= 0.69 FT
 A= 3.46 SF
 P= 7.33 FT
 V= 3.18 FPS
 F= 0.80
 SUB-CRITICAL FLOW



GRADED SPILLWAY AS PER DETAIL
 SIDE SLOPES 3:1
 PROVIDE NORTH AMERICAN GREEN
 - PROVIDE N.A.G. EROSION MAT C125
 WITH STAPLE PATTERN "D"

TYPICAL REAR YARD SWALE

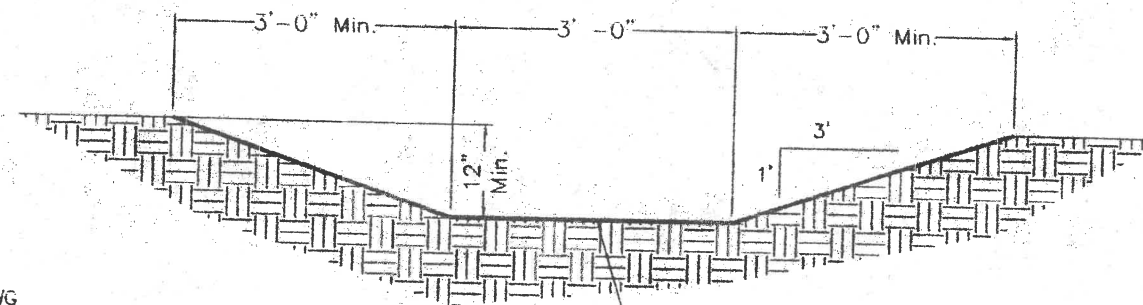
TYPICAL DRAINAGE SWALE - LOT 31-42



SLOPE OF SWALE TO BE PER PROFILE DWG
 WITH 2' WIDE BOTTOM AND 3:1 SIDE SLOPES
 - PROVIDE N.A.G. EROSION MAT C125
 WITH STAPLE PATTERN "D"

TYPICAL REAR YARD SWALE

TYPICAL DRAINAGE SWALE - LOT 1-6



SLOPE OF SWALE TO BE PER PROFILE DWG
 WITH 2' WIDE BOTTOM AND 3:1 SIDE SLOPES
 - PROVIDE N.A.G. EROSION MAT C125
 WITH STAPLE PATTERN "D"

TYPICAL DRAINAGE SWALE

SIDE OR REAR YARDS AS REQUIRED - CONSULT ENGINEER

TOP OF DAM = 456.00

TOP OF DAM = 456.00

TOP OF SPILLWAY = 454.90

3:1 SIDE SLOPES

NORMAL WATER ELEVATION = 453.00

4:1 SLOPE
 TO TWO FEET BELOW
 NORMAL WATER ELEVATION

EMERGENCY SPILLWAY

Enter up to 10 weirs.

Enter <Return> only for flowrate and length to end.

3:1 SLOPE

FLOWRATE (CFS)	LENGTH (FT)	COEFF (-)	HEAD (FT)

EXISTING DITCH SLOPE 2:1
 AND GREATER

EXISTING UN-NAMED TRIBUTARY TO POND
 FLAT DITCH LATERAL "A"
 DITCH HAS 3' BOTTOM AND 2:1 SIDE SLOPES
 AND GREATER.

earthfill contains particles
 of gravel or coarse sand to
 desired proportions. This
 must be 20% by weight of clay
 and 10% by weight of gravel or

CUTTING LINE
 EAST JORDAN
 NO. 2030 CA
 W/ NO. 2030 CA
 W/ NO. 2030 CA
 W/ NO. 2030 CA
 TYPE 1-1
 TYPE 1-2
 TYPE 1-3
 SEAL BOLT HO
 W/ N.A.G.
 MASONRY
 PRECAST

15341 AJ DRIVE

LOT 39 CHADWICK PLACE

FROM PLANS - DITCH DESIGN 11.03 CFS

3 BOTTOM

3:1 SIDE

$n = 0.035$

SCOPE = 0.0153

DITCH WILL CARRY FLOW AT 0.69 FEET

PLANS SHOW 15" MIN

CHANNEL 3' + 3'7" + 3'7"

(SHOULD BE 3'9") \Rightarrow 10.5'

INDEPENDENT CONCRETE PIPE COMPANY



SALES OFFICES	TELEPHONE
INDIANAPOLIS, IN317/262-4920
MISHAWAKA, IN574/259-5401
ST. LOUIS, MO314/842-2900
LOUISVILLE, KY502/448-2920
TOLEDO, OH419/841-3361

PROJECT _____

ITEM _____

DESIGNED _____ CHECKED _____

DATE _____



VANDERBURGH COUNTY ENGINEERING DEPARTMENT

201 Northwest Fourth Street • Suite 306
Old Vanderburgh County Courthouse
Evansville, IN 47708-1358
Phone (812) 435-5773
Fax (812) 435-5676

August 23, 2011

Mr. Brian Murphy
New Urban Investments LLC
5716 Hogue Road
Evansville, IN 47712

Dear Mr. Murphy:

Based on an inspection of Chadwick Place Subdivision, the items that need to be addressed currently include the following:

1. Install all applicable erosion control measures on all lots where homes are under construction. This shall also include inlet protection at curb inlets and area drains in the vicinity of lots under construction. At the time of this inspection there were none of the above in place and several lots were under construction.
2. All sediment must be removed from the storm sewer system.
3. The drainage swale behind lot #32 does not appear to have sufficient grade for water to reach area drain #503. The swale also does not have the 3:1 side slopes as shown on the approved drainage plans. If this swale does not have a grade of at least 0.80%, a concrete ribbon will be necessary.
4. The drainage swale from lots #11 thru #26 is not built according to the approved drainage plans. Also there are 2 fences encroaching in this swale located at 15144 & 15212 AJ Drive. There are decorative bricks placed at the bottom of the fence at 15212 AJ Drive possibly to block the flow through their yard.
5. The drainage easement behind lots 26 thru 29 was so overgrown with vegetation that it was not possible to observe whether the water is draining to the basin or not.
6. Ensure that all swales are constructed according to the approved drainage plans after construction is completed on existing empty lots.
7. The curb sections poured for handicap ramps at AJ Drive and Natalie Drive will need to be replaced since there are no sidewalks in this subdivision.

Once these items have been addressed, please contact me so that another inspection can be completed.

Sincerely,

John Stoll, P.E.
Vanderburgh County Engineer

cc: Bill Jeffers, Vanderburgh County Surveyor

CHADWICK PLACE SUBDIVISION
DETENTION BASIN RESPONSIBILITY INSTRUCTIONS

During construction of Chadwick Place Subdivision, the general contractor shall monitor the discharge structures of the detention basin located on Outlot A. Debris on or around the outlet structures must be collected and disposed of in a proper manner acceptable to all local, state, and federal authorities. The outlet structures must remain unobstructed. Upon completion of the construction of Chadwick Place Subdivision, the developer shall assume responsibility for monitoring and removing debris from the detention basin and its outlet structures until the developer assigns the maintenance responsibilities to a lot owner or entity. Once assigned, this lot owner or entity shall be responsible for maintenance of the detention basin as well as monitoring and removing debris from the outlet structures.

RECEIVED BY THE
VANDERBURGH COUNTY
SURVEYOR'S OFFICE

10/2007



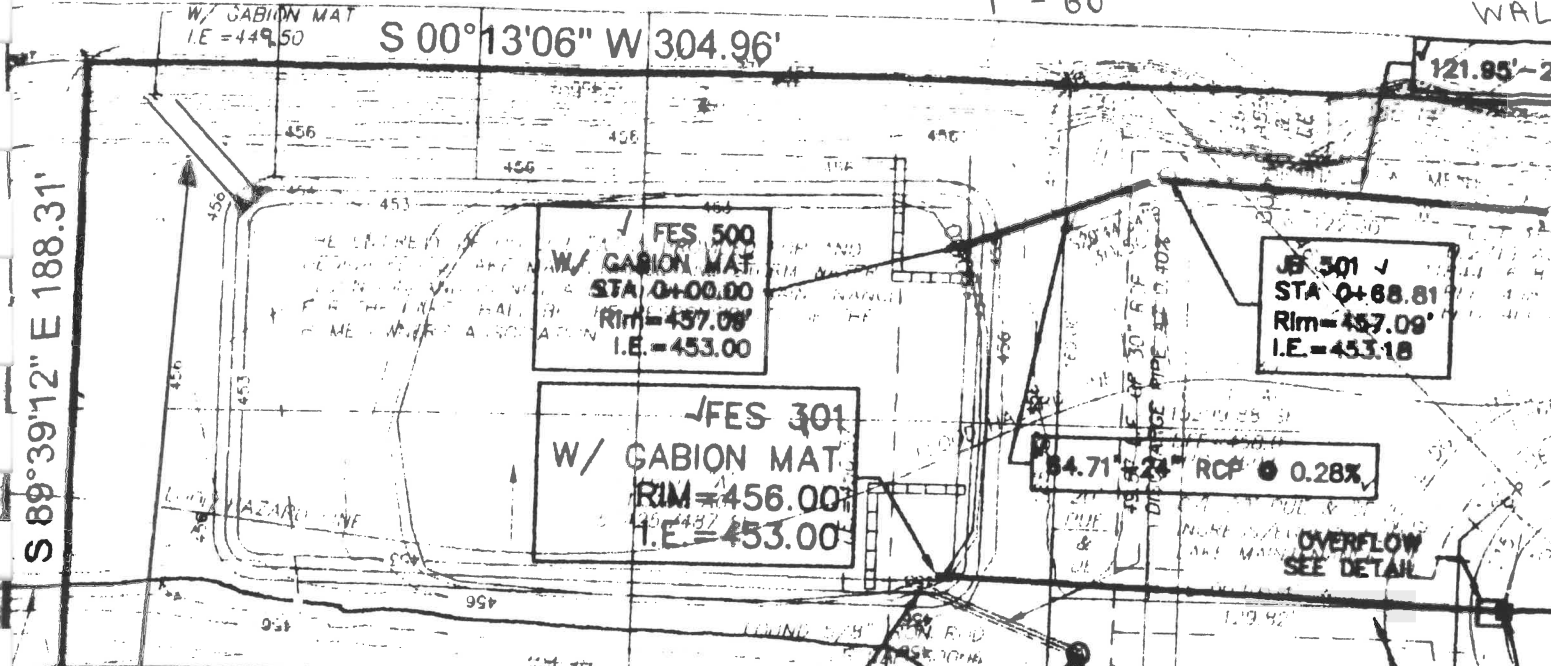
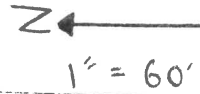
CHADWICK PLACE SUBDIVISION

BASIN OUTLET PIPES

7168-40

10/3/07

WAL



N 00°12'59" E 304.96'

2 - 38" x 24" CONCRETE
ELLIPTICAL PIPES WITH
FLARED END SECTIONS ON
UPSTREAM ENDS

NORTHWEST FES

UPSTREAM IE = 453.00 LENGTH = 6'
DOWNSTREAM IE = 452.55 SLOPE = 7.47%

NORTHWEST PIPE

UPSTREAM IE = 452.55 LENGTH = 40.85'
DOWNSTREAM IE = 449.50 SLOPE = 7.47%

SOUTH EAST FES

UPSTREAM IE = 453.00 LENGTH = 6'
DOWNSTREAM IE = 452.49 SLOPE = 8.49%

SOUTHEAST PIPE

UPSTREAM IE = 452.49 LENGTH = 35.23'
DOWNSTREAM IE = 449.50 SLOPE = 8.49%

RECEIVED BY THE
VANDERBURGH COUNTY
SURVEYOR'S OFFICE
10/2007

S 89°39'12" E 131.70'

175.44'-21" RCP
AT 0.86%

14.71'-23" RCP @ 0.28%

JES 301
STA 0+68.81
Rim = 457.09'
I.E. = 453.18

FES 500
W/ GABION MAT
STA 0+00.00
Rim = 457.09'
I.E. = 453.00

FES 301
W/ GABION MAT
RIM = 456.00'
I.E. = 453.00

121.95'-2'

OVERFLOW
SEE DETAIL

166.5'-21"

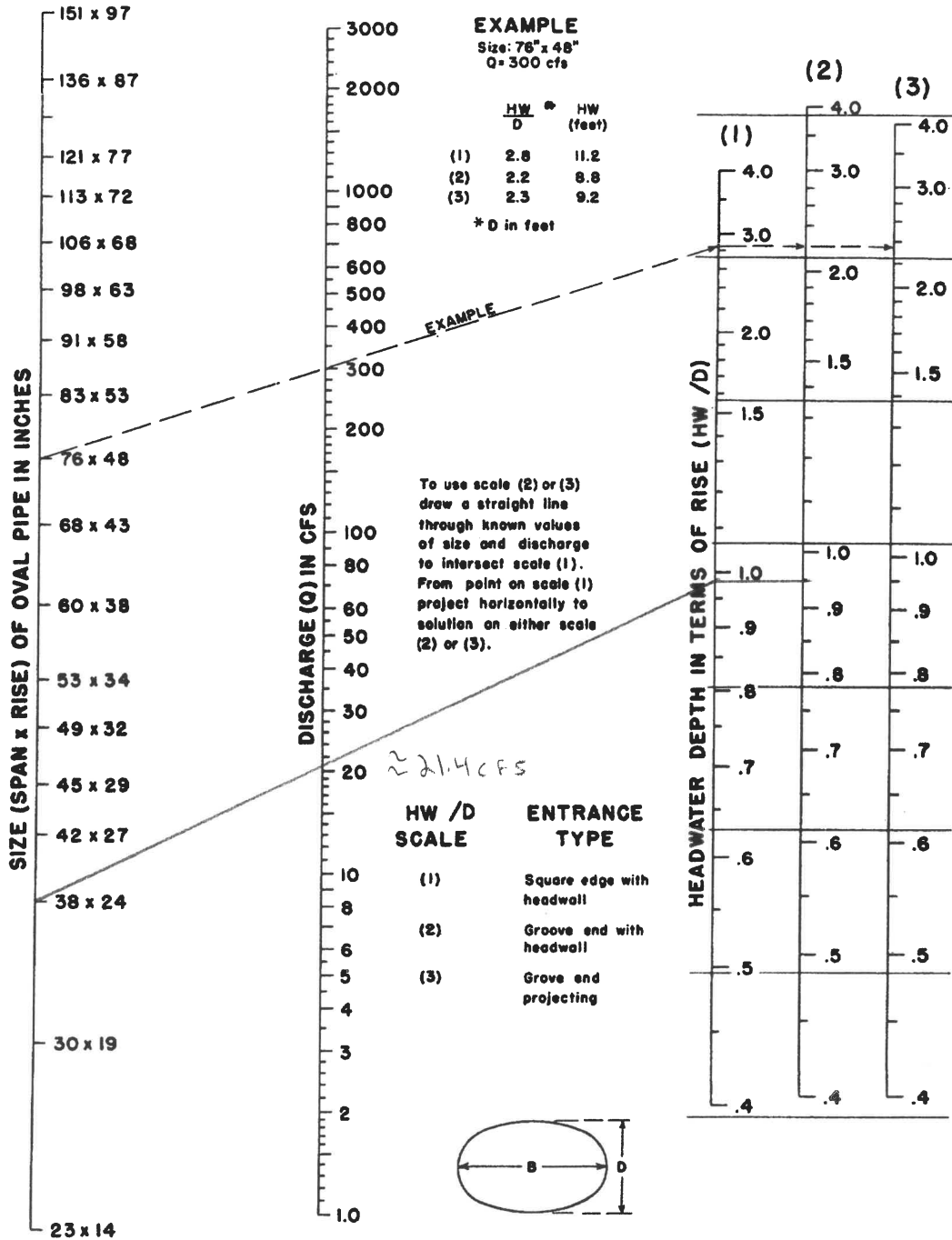
SD
STA 9+
Rim ELEV = 45
I.E. = 45

29.0

CHADWICK PLACE
BASIN OUTFLOW PIPE

716848
9/28/63
M.R.

CHART 29



HEADWATER DEPTH FOR
OVAL CONCRETE PIPE CULVERTS
LONG AXIS HORIZONTAL
WITH INLET CONTROL

Drainage Study
for:
Chadwick Place
Vanderburgh Co. Indiana

May 5, 2006
updated 9/27/06



Ralph A. Easley, Jr.
Ralph A. Easley, Jr., P.E.
Indiana Registration 12892

Prepared by:
Andy Easley Engineering, Inc.
1133 West Mill Road
Evansville, IN 47710
Ph: 812-424-2481
email - easley@evansville.net

RECEIVED BY THE
VANDERBURGH COUNTY
SURVEYOR'S OFFICE

ME
10:15 AM
10/12/06

**DRAINAGE CALCULATIONS FOR CHADWICK PLACE SUBDIVISION
PECK ROAD
VANDERBURGH COUNTY, INDIANA**

SITE LOCATION:

The proposed site is located on the West of Kingsmont Subdivision Section III, South of Baseline Road, North of Old State Road, and East of Peck Road in Section 4, Township 5, South, Range 10 West in Scott Township, Vanderburgh County, Indiana.

This site is also located within the North U.S. Highway 41 Industrial Corridor Impact Drainage Area and is subject to Section 13.04.015 of the Vanderburgh Country Drainage Ordinance and thus may only release at the ten year return period storm when being subjected to a 100 year return period storm or less.

GENERAL NOTES:

The proposed development will have 43 Lots with two lakes situated on 14.5 acres

EXISTING CONDITIONS:

Previous Use: Agricultural - row crops.

Soil types:

HoB2 = Hosmer Silt Loam, 2 to 6 percent slopes, eroded

HoC3 = Hosmer Silt Loam, 6 to 12 percent slopes, severely eroded

He = Henshaw Silt Loam

Gross Area = 14.50 Acres

EXISTING DRAINAGE PATTERN:

The proposed subdivision consists of 14 acres and is located at the lower end of a 20.92 acre watershed.

Half an acre at the southeast corner drains easterly and onto a heavily wooded lot. There is a defined ditch that carries this drainage north. This area will be mainly rear yards and will produce less runoff than the existing conditions.

There is also an are of approximately one acre at the southwest corner of the subject that drains to an existing ditch located along the northside of the "flag staff" access strip to Peck Road. This 60' strip of ground will be dedicated as an outlot and as a public utility and drainage easement.

The entire watershed drains from south to north - with an average slope of approximately 7% - into an existing lake located at the northern end of the subject property. This lake does not have a proper release structure, but rather has a low bank that allows overflow spillage to the northwest.

6.597 acres drains offsite from west to east and onto the subject property.

By examination of satellite photos it was determined that this entire watershed consists of agricultural use.

Existing Watershed Geometry:

Area: 20.92 Acres (gross)
Existing Agricultural = 20.92 acres (slopes of 5% to 10%) C=0.50

All undeveloped runoff coefficients were taken from the Vanderburgh County Drainage Ordinance.

The Undeveloped Runoff Coefficient = 0.50

L = 1606.2004 feet
H = 494-454 = 40 feet
t_c = 20 minutes as per attached nomograph

From the Rainfall Intensity as per Vanderburgh County Drainage Ordinance
i = 4.085"/hour for a 10 year storm, 4.571"/hr for a 25 year storm and 5.665"/hr for the 100 year storm.

Q for the 10 year storm = CiA = 0.50 * 4.085 * 20.92 = 42.73 CFS
Q for the 25 year Storm = CiA = 0.50 * 4.571 * 20.92 = 47.81 CFS
Q for the 100 year Storm = CiA = 0.50 * 5.665 * 20.92 = 59.256 CFS

Proposed 14.00 acre development Geometry:

Total area = 14.50 Acres
New Structures = 43 lots x 2930 sf/ea = 126,000 SF = 2.893 acres C=0.98
Private driveways = 43 lots x 16' x 34.6' = 23856 SF = 0.548 acres C=0.96
Patios and walks = 43 lots x 975 sf/ea = 41,925 SF = 0.964 acres C=0.92
Roadways = 53,510.24 SF = 1.228 acres C=0.95
Sidewalks = 0 SF = 0 acres C=0.95
Yard Area = 8.350 acres C=0.40
Lakes = 22,500 SF = 0.517 acres C=1.00
Developed runoff coefficient =

$$\frac{(2.893 * 0.98) + (0.548 * 0.96) + (0.964 * 0.92) + (1.228 * 0.95) + (8.350 * 0.40) + (0.517 * 1.0)}{14.50}$$

Developed runoff coefficient = 0.64

SEE FORM 800 - ATTACHED TO THIS REPORT

The proposed retention facility must be able to allow the discharge of the undeveloped Q for the 10 year event (42.73 CFS) and yet "demonstrate clearly that the post development peak rate of storm water runoff during a one hundred (100) year return period storm is controlled sufficiently so that it will not exceed the peak runoff rate from the same Project site in its pre development condition during a ten (10) year return period storm." - as required due to this sites location within the North U.S. Highway 41 Industrial Corridor Impact Drainage Area and is subject to Section 13.04.015 of the Vanderburgh County Drainage Ordinance and thus may only release at the ten year return period storm when being subjected to a 100 year return period storm or less.

Required retention = 21,101.11 CF

It is the developers desire to utilize the existing lake located at the north end of the property for retention by providing a release structure and an emergency overflow spillway as indicated on the plans. This lake will be fed by the proposed storm sewer from this site and additional discharge from the proposed adjoining subdivision to the west. A two stage weir is proposed with the first weir allowing the 10 year undeveloped storm to pass (42.73 CFS). The second stage of the weir would allow the 100 year developed storm (75.85 CFS- see below) for the entire storm to pass.

The existing lake has approximately one foot of free board as constructed. The lake will be modified and expanded as indicated on the plans.

The normal water elevation will be 453.00.

The storage elevation shall be 453.90. This provides 23,579.64 cubic feet of storage or 10% more than required.

The outlet control for the proposed lake will be provided by a concrete weir box. This design has been used by this office successfully in Warrick County, Indiana at Copper Creek Subdivision on Bell Road, the conceptual design of which was reviewed and approved by Morley and Associates and Commonwealth Engineering This structure allows for 3 separate weirs to function along the sides of a square structure located within the lake. An outlet pipe than carries the weir discharge to the existing ditch or creek.

The required weir to pass the 10 year event must be capable of passing 42.73 CFS, as stated above. Computer analysis indicates the following:

WEIRS

Enter up to 10 weirs.

Enter <Return> only for flowrate and length to end.

FLOWRATE (CFS)	LENGTH (FT)	COEFF (-)	HEAD (FT)
42.73	19.0	2.630	0.9

The outlet control structure will then have 3 weirs with a combined length of 19.0 feet.

Normal or low water elevation has been set at 453.00 and an allowable head of 0.90 feet.
The storage elevation will be $453.0 + 0.90 = 453.90$

The release box will require a minimum inside width of 7.0 feet to provide the (3) 6.3 feet weirs. This results in a box with an opening of 53.77 SF. Utilizing the formula below, the head can be solved to determine the the water elevation during the 100 year event.

$$Q \text{ for the 100 year Storm} = C_i A = 0.64 * 5.665 * 20.92 = 75.85 \text{ CFS}$$

$$Q = 0.6 A * \sqrt{2GH}, \text{ where}$$

A = area of orifice

G = gravity (32.2)

H = head

$$75.85 = 0.6 * 53.78 * (\sqrt{2 * 32.2 * H})$$

H = 0.09 feet. Therefore, the highwater elevation for the 100 year event = 453.90 + 0.09 = 453.99. This assumes that the weirs are clogged. If the weirs remain open and operational and passing the allowed 42.73 CFS, the lake will raise only another 0.02 (453.92) feet with the top of the box acting as an orifice.

If the box was to act as a broadcrested weir (with the normal weirs) in operation the anticipated elevation would be 453.90 + 0.60 = 454.50 (normal weirs passing 42.73 CFS, requiring (75.85 - 42.73) 36.02 CFS discharge.

FLOWRATE (CFS)	LENGTH (FT)	COEFF (-)	HEAD (FT)
36.02	28.0	2.70	0.61

Therefore the 100 year elevation for the lake will be 454.90

The discharge pipe out of the Outlet Control Structure has been sized to pass the 100 year event based on the following:

DISCHARGE SEWER PIPE

Enter up to 10 pipes.

Enter <Return> only for flowrate and diameter to end.

FLOWRATE (CFS)	DIAMETER (IN)	FRICTION (FT ^{1/6})	SLOPE (%)	VELOCITY (FPS)
75.85	40.39	0.0130	0.70	8.52
84.18	42.00	0.0130	0.70	8.75

The elevation of the top of the dam has been set at 456.00 and an emergency spillway provided adjacent to the proposed outlet structure. The spillway will have a width of 30 feet and a head of 0.50 based on the following computer analysis:

EMERGENCY SPILLWAY

Enter up to 10 weirs.

Enter <Return> only for flowrate and length to end.

FLOWRATE (CFS)	LENGTH (FT)	COEFF (-)	HEAD (FT)
75.85	60.4	2.700	0.60

Setting the spillway elevation equal to the highwater elevation for the 100 year event (454.90) and adding 0.60 feet for the required head results in a water elevation equal to 455.5 feet. This provides for 0.50 feet of required freeboard during the 100 year event.

The spillway will flow directly into the unnamed tributary of Pond Flat Ditch Lateral A.

Project: CHADWICK PLACE - Peck road - detention design

Designer: Easley Engineering

Detention Facility Design Return Period: 100 year

Release Rate Return Period: 10 year

Watershed Area (Au): 14.50

Developed Area (Ad): 14.50

Time of Concentration: 20.00

Rainfall Intensity: (i 10) = 4.085

Undeveloped Runoff Coefficient (Cu) = 0.50

Undeveloped Runoff Rate (Q=(Cu)(iu)(Au) = 29.61625

Developed Runoff Coefficient (Cd)= 0.64

Storm Duration	Rainfall Intensity	Inflow Rate	Outflow Rate	Storage Rate	Required Storage
td (hrs)	ld (in./hr)	Cd'ldAD (cfs)	CuiuAu (cfs)	I(td)_O (cfs)	[I(td)-0 td]/12 (acre-ft)
0.08	7.936	73.64608	29.61625	44.02983	0.2935322
0.17	6.616	61.39648	29.61625	31.78023	0.45021992
0.25	5.697	52.86816	29.61625	23.25191	0.48441479
0.50	4.194	38.92032	29.61625	9.30407	0.38766958
1.00	2.412	22.38336	29.61625	-7.23289	-0.60274083
		0	29.61625	-29.61625	0
		0	29.61625	-29.61625	0
		0	29.61625	-29.61625	0
		0	29.61625	-29.61625	0

Peak storage requirement = 0.48441479 acre-feet = 21101.1082524 cubic feet of storage.

SUBDRAINAGE AREA 101

AREA 171,891.30 SF

Houses	<u>12,000</u>	C= <u>0.95</u>	n= <u>0.02</u>
Patios & Walks	<u>5,760</u>	C= <u>0.95</u>	n= <u>0.02</u>
Roads	<u>3,434</u>	C= <u>0.95</u>	n= <u>0.02</u>
Sidewalks	<u>0.0</u>	C= <u>0.0</u>	n= <u>0.0</u>
Greenspace	<u>150697.3</u>	C= <u>0.50</u>	n= <u>0.40</u>

Cd 0.55548448

nd 0.35314644

Length of watershed (L) 905.68

Height of watershed (H) 21

Slope of watershed (H/L) = 0.023187

$t_c = 0.827 \{(n \cdot L) / \sqrt{S}\}^{0.467} =$ 29.446

$i_{25} =$ 3.697

$Q = ciA =$ 8.10377557

$i_{100} =$ 4.667

$Q_{100} = ciA =$ 10.23000287

$n \cdot L =$ 319.83766778

$\sqrt{S} =$ 0.15227278

$n \cdot L / \sqrt{S} =$ 2100.42574766

SUBDRAINAGE AREA 102

AREA 19967.18 SF

Houses	<u>6000</u>	C= <u>0.95</u>	n= <u>0.02</u>
Patios & Walks	<u>2880</u>	C= <u>0.95</u>	n= <u>0.02</u>
Roads	<u>3,454</u>	C= <u>0.95</u>	n= <u>0.02</u>
Sidewalks	<u>0.0</u>	C= <u>0.95</u>	n= <u>0.02</u>
Greenspace	<u>7633.18</u>	C= <u>0.50</u>	n= <u>0.40</u>

Cd 0.77797115

nd 0.16526881

Length of watershed (L) 264.53

Height of watershed (H) 9

Slope of watershed (H/L) = 0.03402261

$t_c = 0.827 \{(n \cdot L) / \sqrt{S}\}^{0.467} =$ 10.63

$n \cdot L =$ 43.71855831

$i_{25} =$ 5.813

$\sqrt{S} =$ 0.18445219

$Q = ciA =$ 2.07296838

$n \cdot L / \sqrt{S} =$ 237.01837484

$i_{100} =$ 7.009

$Q_{100} = ciA =$ 2.49947279

SUBDRAINAGE AREA 103

AREA 168,952.99 SF

Houses	<u>16000</u>	C= <u>0.95</u>	n= <u>0.02</u>
Patios & Walks	<u>7680</u>	C= <u>0.95</u>	n= <u>0.02</u>
Roads	<u>4981</u>	C= <u>0.95</u>	n= <u>0.02</u>
Sidewalks	<u>0.0</u>	C= <u>0.95</u>	n= <u>0.02</u>
Greenspace	<u>140291.99</u>	C= <u>0.50</u>	n= <u>0.40</u>

Cd 0.57633751

nd 0.33553722

Length of watershed (L) 968.07

Height of watershed (H) 18

Slope of watershed (H/L)=0.0185937

$t_c = 0.827 \{ (n \cdot L) / \sqrt{S} \}^{0.467} =$ 31.71

$i_{25} =$ 3.467

$Q = ciA =$ 7.75012556

$i_{100} =$ 4.497

$Q_{100} = ciA =$ 10.0525857

$n \cdot L =$ 324.82351657

$\sqrt{S} =$ 0.13635872

$n \cdot L / \sqrt{S} =$ 2382.12500506

SUBDRAINAGE AREA 104

AREA 24,344.41 SF

Houses	<u>4000</u>	C= <u>0.95</u>	n= <u>0.02</u>
Patios & Walks	<u>1920</u>	C= <u>0.95</u>	n= <u>0.02</u>
Roads	<u>4169</u>	C= <u>0.95</u>	n= <u>0.02</u>
Sidewalks		C= <u></u>	n= <u></u>
Greenspace	<u>14255.41</u>	C= <u>0.50</u>	n= <u>0.40</u>

Cd 0.6864925

nd 0.24251744

Length of watershed (L) 294.50

Height of watershed (H) 3

Slope of watershed (H/L) = 0.01018676

$t_c = 0.827 \{(n \cdot L) / \sqrt{S}\}^{0.467} =$ 17.71

$n \cdot L =$ 71.42138608

$\sqrt{S} =$ 0.10092948

$n \cdot L / \sqrt{S} =$ 707.63652087

$i_{25} =$ 4.782

$Q = ciA =$ 1.8346649

$i_{100} =$ 5.907

$Q_{100} = ciA =$ 2.26628305

SUBDRAINAGE AREA 105- WEST LAKE

AREA 99209.18 SF

Houses	<u>10,000</u>	C= <u>0.95</u>	n= <u>0.02</u>
Patios & Walks	<u>4,800</u>	C= <u>0.95</u>	n= <u>0.02</u>
Roads	<u>19,130.60 - lake</u>	C= <u>1.00</u>	n= <u>0.0</u>
Sidewalks	<u>0.0</u>	C= <u>0.95</u>	n= <u>0.02</u>
Greenspace	<u>103539.78</u>	C= <u>0.40</u>	n= <u>0.40</u>

Cd 0.36635029

nd 0.42044408

Length of watershed (L) 279.91

Height of watershed (H) 15

Slope of watershed (H/L)=0.05358865

$t_c = 0.827 \{ (n \cdot L) / \sqrt{S} \}^{0.467} =$ 15.181

$n \cdot L =$ 117.68650243

$i_{25} =$ 5.016

$\sqrt{S} =$ 0.23149222

$n \cdot L / \sqrt{S} =$ 508.38210645

$Q = ciA =$ 4.18521773

$i_{100} =$ 6.175

$Q_{100} = ciA =$ 5.15225667

SUBDRAINAGE AREA AREA 200 - LAKE

AREA 86,798.32 SF

Houses	<u>10,930</u>	<u>C=0.95</u>	<u>n=0.02</u>
Patios & Walks	<u>5,368</u>	<u>C=0.95</u>	<u>n=0.02</u>
Roads	<u>0.0</u>	<u>C=0.95</u>	<u>n=0.02</u>
Sidewalks	<u>17,263.52 LAKE</u>	<u>C=0.95</u>	<u>n=0.02</u>
Greenspace	<u>53236.8</u>	<u>C=0.25</u>	<u>n=0.40</u>

Cd 0.52066266

nd 0.25306884

Length of watershed (L) 202.08

Height of watershed (H) 11

Slope of watershed (H/L)=0.05443389

$t_c = 0.827 \{ (n \cdot L) / \sqrt{S} \}^{0.467} =$ 10.249

$n \cdot L =$ 51.14015119

$\sqrt{S} =$ 0.23331072

$n \cdot L / \sqrt{S} =$ 219.19331949

$i_{25} =$ 5.881

$Q = ciA =$ 6.10142196

$i_{100} =$ 7.080

$Q_{100} = ciA =$ 7.3453609

SUBDRAINAGE AREA AREA 201R

AREA 47,182.49 SF

Houses	<u>10,000</u>	C= <u>0.95</u>	n= <u>0.02</u>
Patios & Walks	<u>9,600</u>	C= <u>0.95</u>	n= <u>0.02</u>
Roads	<u>8,558</u>	C= <u>0.95</u>	n= <u>0.02</u>
Sidewalks	<u>0.0</u>	C= <u>0.95</u>	n= <u>0.02</u>
Greenspace	<u>19024.49</u>	C= <u>0.25</u>	n= <u>0.40</u>

Cd 0.66775243

nd 0.17322011

Length of watershed (L) 394.59

Height of watershed (H) 9

Slope of watershed (H/L)=0.02280848

$t_c = 0.827 \{(n \cdot L) / \sqrt{S}\}^{0.467} =$ 14.379

$n \cdot L =$ 68.3509232

$i_{25} =$ 5.144

$\sqrt{S} =$ 0.15102477

$Q = ciA =$ 3.72056951

$n \cdot L / \sqrt{S} =$ 452.58087928

$i_{100} =$ 6.310

$Q_{100} = ciA =$ 4.56391788

SUBDRAINAGE AREA AREA 202R

AREA 105,900.55 SF1 SF

Houses	<u>8000</u>	C= <u>0.95</u>	n= <u>0.02</u>
Patios & Walks	<u>3840</u>	C= <u>0.95</u>	n= <u>0.02</u>
Roads	<u>12,729.72</u>	C= <u>0.95</u>	n= <u>0.02</u>
Sidewalks	<u>0.0</u>	C= <u>0.95</u>	n= <u>0.02</u>
Greenspace	<u>81330.38</u>	C= <u>0.40</u>	n= <u>0.40</u>

Cd 0.52760466

nd 0.31183678

Length of watershed (L) 1088.43

Height of watershed (H) 31.5

Slope of watershed (H/L) = 0.02894077

$$tc = 0.827 \left\{ \frac{(n \cdot L)}{\sqrt{S}} \right\}^{0.467} = \underline{28.747}$$

$$n \cdot L = \underline{339.41250646}$$

$$i_{25} = \underline{3.762}$$

$$\sqrt{S} = \underline{0.17011987}$$

$$Q = ciA = \underline{4.82542881}$$

$$n \cdot L / \sqrt{S} = \underline{1995.13734909}$$

$$i_{100} = \underline{4.740}$$

$$Q_{100} = ciA = \underline{6.07988638}$$