

PRELIMINARY DRAINAGE REPORT

***MEADOWS TENNIS CLUB***

5555 Racquet Lane  
Boulder, Colorado

November 3, 2014

Prepared for:

Meadows Tennis Club

Prepared by:

***SCOTT, COX & ASSOCIATES, INC.***

consulting engineers - surveyors  
1530 55th Street - Boulder, CO 80303  
303-444-3051

Project No. 14536B

***ENGINEER'S STATEMENT***

I hereby certify that this report for the preliminary drainage design for the Site Review at 5555 Racquet Lane was prepared under my direct supervision in accordance with the provisions of the City of Boulder Design and Construction Standards for the owners thereof.

---

Donald P. Ash  
Registered Professional Engineer  
State of Colorado No. 36045

## **TABLE OF CONTENTS**

	<u>Page Number</u>
INTRODUCTION	1
PREVIOUS REPORTS/PLANS	1
EXISTING ON-SITE DRAINAGE	1
OFF-SITE DRAINAGE	1
PROPOSED ON-SITE DRAINAGE	1
DRAINAGE DESIGN CRITERIA	2
DETENTION STORAGE	3
STORM WATER QUALITY AND EROSION CONTROL	3
FLOOD STATEMENT	4
CONCLUSIONS	4
FIGURES:	
VICINITY MAP	
PRELIMINARY GRADING AND DRAINAGE PLAN	
APPENDIX A:	
RUNOFF CALCULATIONS	
APPENDIX B:	
DETENTION POND CALCULATIONS	
APPENDIX C:	
PREVIOUS DRAINAGE STUDIES	

## **INTRODUCTION**

This report is submitted as the Preliminary Drainage Report of the existing and proposed conditions for the Meadows Tennis Club, located at 5555 Racquet Lane in the City of Boulder. The site is located in the Southwest ¼ of Section 34, Township 1 North, Range 70 West of the 6<sup>th</sup> Prime Meridian, in the City of Boulder, Boulder County, State of Colorado. The site is bounded by existing residential subdivisions on all sides. A Vicinity Map is included with this report.

This report is being prepared to accompany the Site Review submittal for the project. The purpose of this Preliminary Drainage Report and Plan is to address specific drainage issues related to the proposed site changes. This study meets the requirements set forth in the City of Boulder Design and Construction Standards.

## **PREVIOUS REPORTS/PLANS**

The “Preliminary Drainage Plan” prepared by McDowell, Scott & Cox, Inc., dated May 1976 and the “Final Drainage Plan” prepared by Scott, Cox and Associates, Inc., dated February 15, 2010 were referenced in order to determine the required capacity of the existing detention basin.

## **EXISTING ON-SITE DRAINAGE**

The existing 4.50 acre site is currently developed with tennis courts and landscaping improvements. The site generally slopes from the southwest to the northeast at an approximate slope of 2%. Existing drainage patterns are shown on the Grading, Drainage and Erosion Control Plan that is included with this report. Existing runoff calculations for the existing basin have been included in Appendix A. The runoff from the existing site is summarized in Table 1.

## **OFF-SITE DRAINAGE**

A portion of the sites to the west currently drain through the proposed site to the detention area at the northeast corner of the site. The proposed improvements will not alter the drainage path that accommodates these offsite flows per the Drainage Plan for Meadow Glen, 1976.

## **PROPOSED ON-SITE DRAINAGE**

The Grading, Drainage & Erosion Control Plan shows the proposed Site Plan, on-site grading and overland flow directions. The intent of the proposed drainage plan is to account for the increased runoff due to the proposed improvements.

The existing tennis facilities make up Site 2, North from the previous drainage plan. Drainage calculations are included on the previous drainage plan which shows the site discharge and allowable release rates. Under the proposed conditions, the site will remain a single major drainage sub-basin, Basin A. Runoff within this basin is conveyed to the proposed detention facility via overland and channel flow from the southwest to the northeast. All roof runoff from the existing and proposed building will be conveyed to the proposed detention facility.

Proposed drainage patterns are shown on the Grading, Drainage and Erosion Control Plan. Proposed runoff calculations for Basin A have also been enclosed in Appendix A. Proposed runoff from the site is shown in Table 1.

### **DRAINAGE DESIGN CRITERIA**

As required in City of Boulder Design and Construction Standards for Drainage Improvements (CBDCS) for all non-single family residential uses, hydrologic information was developed for an initial storm return period of 5-years and major storm return period of 100-years. The criteria and methodology used in determining the storm runoff peaks and volumes were those outlined in the CBDCS.

The design rainfall data used in this study was taken from the time-intensity-frequency curve for the City of Boulder (Figure 7-1 CBDCS) as developed by Urban Drainage and Flood Control District (UD&FCD). Runoff calculations were obtained using the Rational Method as outlined in the CBDCS for basins having less than 160 acres.

The Rational Formula is:

$$Q = CIA$$

Where:      Q = Peak Discharge (cfs)  
              C = Runoff Coefficient (Table 7-2 CBDCS)  
              I = Rainfall Intensity (in/hr) (Figure 7-1 CBDCS)  
              A = Drainage Basin Tributary Area (acres)

The existing and proposed conditions for the entire site were analyzed for the 5, 10, and 100-year storm events. The results are shown in the following Table 1 and the relevant calculation sheets are provided in Appendix A.

**TABLE 1**  
**RUNOFF CALCULATIONS SUMMARY**

<u>Drainage Basin</u>	<u>Area</u> (acres)	<u>5-Year Peak</u> <u>Runoff</u> (cfs)	<u>10-Year Peak</u> <u>Runoff</u> (cfs)	<u>100-Year Peak</u> <u>Runoff</u> (cfs)
Historic	4.50	7.27	10.84	20.86
Proposed	4.50	9.23	13.20	22.59

**DETENTION STORAGE**

As shown on the 2010 Final Drainage Plan, an existing detention pond has been provided to accommodate the Water Quality Control Volume as well as the required volume for the 10 year and 100 year storm events. The existing detention pond provided 110% of the maximum 10-year detention volume plus 100% of the water quality capture volume. The existing outlet structure will remain and the pond will be appropriately graded to detain the revised Water Quality Control, 10-year, and 100-year volumes. Release rates are based on the existing, developed runoff from the site. This is in accordance with the City of Boulder Design and Construction Standards.

The berm around the pond provides approximately 1 foot of freeboard above the 100 year water surface elevation. In the event the pond was to overflow, the flow will be directed to the emergency overflow spillway at the northeast corner of the pond. The runoff from the initial and major storm events from the tributary basin can be conveyed directly to the major drainage system without adverse impact to upstream, surrounding, or downstream properties and facilities.

**STORM WATER QUALITY AND EROSION CONTROL**

Erosion control measures should be implemented prior to demolition or construction, and shall be maintained during all phases of construction project. Erosion Control Measures will consist of silt fence along the property being developed, hay bales at grass swales and re-vegetating all disturbed areas with appropriate plant species.

The principal form of storm water quality enhancement is the utilization of a porous landscape detention facility. Surface drainage from the developed surfaces of the site will drain to the detention pond where runoff will infiltrate the gravel basin adjacent to the limited release structure. There is no proposed release of the water quality capture volume due to the grade constraints at the northeast corner of the property. The use of a porous landscape detention facility as a storm water quality enhancement is consistent with the Urban Drainage and Flood Control District Criteria Manual, Volume 3, Best Management Practices.

### **FLOOD STATEMENT**

Based on the FEMA Flood Insurance Rate Map (FIRM) - Map Number 08013C0413 J dated December 18, 2012, the site is located within Zone AE “Areas Subject to Inundation by the 1% Annual Chance Flood”.

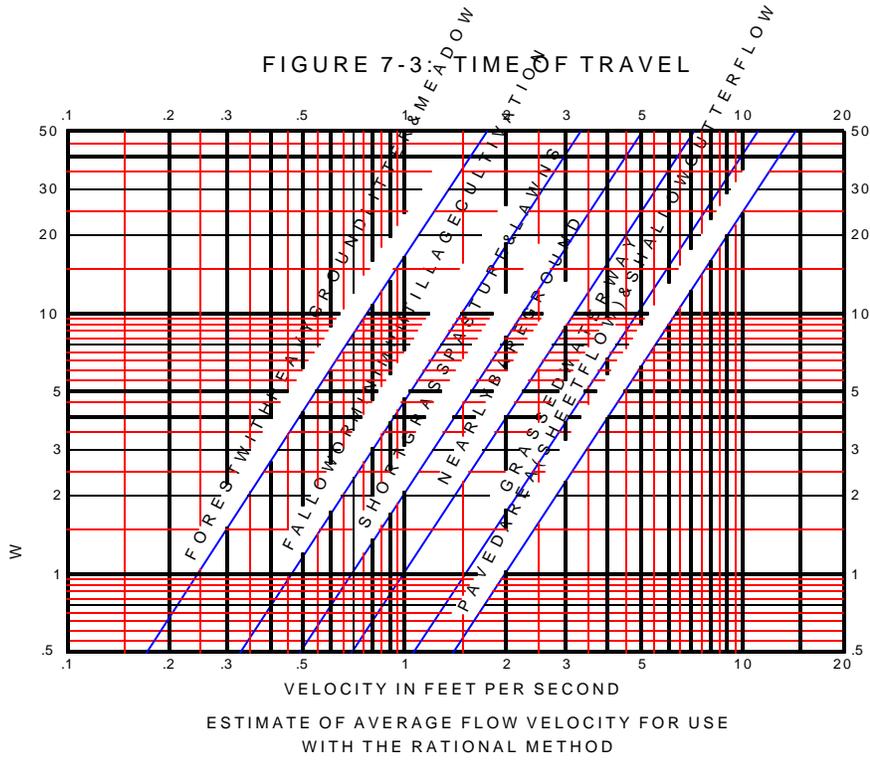
### **CONCLUSIONS**

The primary consideration for this project was to design a drainage plan for the site to accommodate the proposed development plan without having adverse impact on the surrounding properties. The drainage plan handles runoff from 10-year and 100-year storm events. All analyses were performed in accordance with the City of Boulder Design and Construction Standards.

**APPENDIX A**

**RUNOFF CALCULATIONS**

FIGURE 7-3: ESTIMATE OF AVERAGE FLOW VELOCITY FOR USE WITH THE RATIONAL METHOD



**Table 7-2: Runoff Coefficients for the Rational Method**

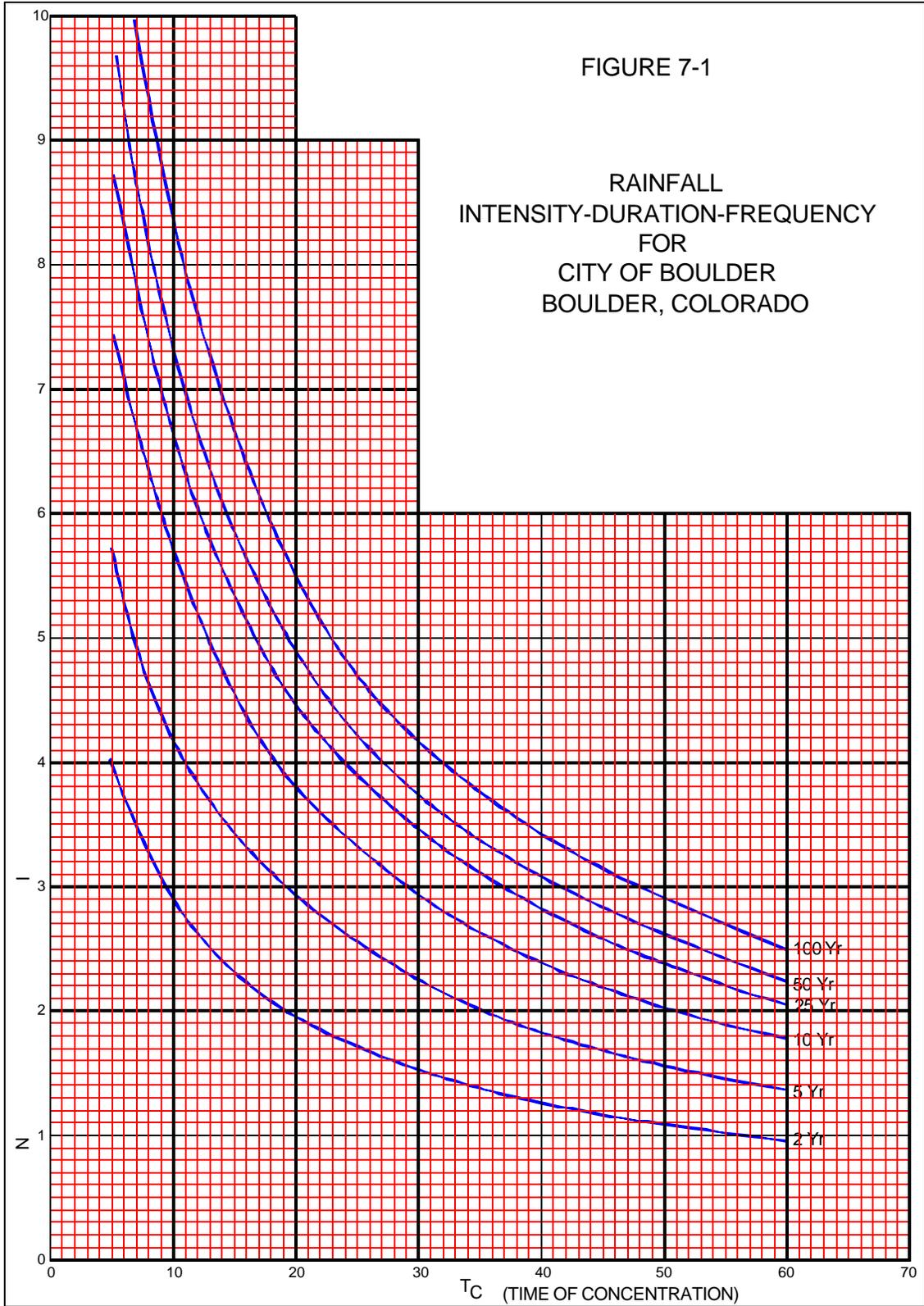
LAND USE OR SURFACE CHARACTERISTICS	PERCENT IMPERVIOUS	STORM FREQUENCY			
		2-Yr	5-Yr	10-Yr	100-Yr
<b><u>Business:</u></b>					
Commercial Areas	95	0.87	0.88	0.90	0.93
Neighborhood Areas	65	0.60	0.65	0.70	0.80
<b><u>Residential:</u></b>					
Single-Family	40	0.40	0.45	0.50	0.70
Multi-Unit (detached)	50	0.50	0.55	0.60	0.75
Multi-Unit (attached)	70	0.65	0.70	0.70	0.80
½ Acre Lot	30	0.30	0.40	0.45	0.65
Apartments	70	0.65	0.70	0.70	0.80
<b><u>Industrial:</u></b>					
Light Areas	80	0.75	0.80	0.80	0.85
Heavy Areas	90	0.80	0.80	0.85	0.90
<b><u>Parks, Cemeteries:</u></b>					
	7	0.15	0.25	0.35	0.60
<b><u>Playgrounds:</u></b>					
	13	0.20	0.30	0.40	0.70
<b><u>Schools:</u></b>					
	50	0.50	0.55	0.60	0.75
<b><u>Railroad Yard Areas:</u></b>					
	40	0.40	0.45	0.50	0.70
<b><u>Undeveloped Areas:</u></b>					
Historic Flow Analysis	2	0.10	0.20	0.30	0.60
Greenbelts, Agricultural	-	-	-	-	-
Offsite Flow Analysis (when offsite land use is not defined)	45	0.45	0.50	0.55	0.72
<b><u>Streets:</u></b>					
Paved	100	0.87	0.88	0.90	0.93
Gravel	7	0.15	0.25	0.35	0.65
<b><u>Drives and Walks:</u></b>					
	96	0.85	.087	0.90	0.92
<b><u>Roofs:</u></b>					
	90	0.80	0.85	0.90	0.90
<b><u>Lawns:</u></b>					
Sandy Soil	0	0.00	0.10	0.20	0.50
Clayey Soil	0	0.10	0.20	0.30	0.60

**NOTE:** These rational formula coefficients do not apply for larger basins where the time-of-concentration exceeds 60 minutes.

(Source: Urban Drainage and Flood Control District)

FIGURE 7-1

RAINFALL  
INTENSITY-DURATION-FREQUENCY  
FOR  
CITY OF BOULDER  
BOULDER, COLORADO



I



SCOTT, COX & ASSOCIATES, INC.  
 consulting engineers • surveyors  
 1530 55th Street  
 Boulder, Colorado 80303  
 (303) 444-3051

5555 Racquet Drive, Boulder, Colorado

Project #: 14536B  
 Date: 11/3/2014  
 By: MRF

Municipality: Boulder	Runoff Coefficients						Initial Overland Time (t <sub>i</sub> ) t <sub>i</sub> =1.8(1.1-C <sub>s</sub> )L <sup>1/2</sup> S <sup>-1/3</sup>			Travel Time (t <sub>t</sub> ) t <sub>t</sub> =Length/(Velocity*60)				t <sub>c</sub> Computed	t <sub>c</sub> Urbanized Check		t <sub>c</sub> Final	Rainfall Intensities (in/hr)				Flow Rates (cfs)				
	Parcel Name	Parcel Size	C <sub>2</sub>	C <sub>5</sub>	C <sub>10</sub>	C <sub>100</sub>	% Impervious	Overland Flow (L <sub>c</sub> ) (ft)	Slope (ft/ft)	t <sub>i</sub> (min)	Length (ft)	Slope (ft/ft)	Cv	Velocity (ft/s)	t <sub>t</sub> (min)	Time of Conc t <sub>i</sub> +t <sub>t</sub> =t <sub>c</sub>	Total Length (ft)	t <sub>c</sub> =(L/180)+10 (min)	Minimum t <sub>c</sub> =5 min	I <sub>2</sub>	I <sub>5</sub>	I <sub>10</sub>	I <sub>100</sub>	Q <sub>2</sub>	Q <sub>5</sub>	Q <sub>10</sub>
Historic	4.50	0.43	0.50	0.57	0.74	42.51	500.0	0.020	19.6	250	0.0100	20	2.00	2.1	21.7	750	14.2	16.3	2.2	3.3	4.3	6.3	4.24	7.27	10.84	20.86
Proposed	4.50	0.58	0.63	0.69	0.80	61.13	500.0	0.020	15.2	250	0.0100	20	2.00	2.1	17.3	750	14.2	16.3	2.2	3.3	4.3	6.3	5.66	9.23	13.20	22.59

**SCOTT, COX & ASSOCIATES, INC.**  
 consulting engineers - surveyors

PROJECT #: 14536B  
 DATE: 11/3/2014  
 BY: MRF

Historic  
 Basin H

SURFACE	AREA	C <sub>2</sub>	C <sub>5</sub>	C <sub>10</sub>	C <sub>100</sub>	%IMP
DRIVES AND WALKS	1.88	0.85	0.87	0.90	0.92	96.00
ROOFS	0.12	0.80	0.85	0.90	0.90	90.00
LAWNS - CLAYEY	2.50	0.10	0.20	0.30	0.60	0.00
<b>TOTAL AREA</b>	<b>4.50</b>	<b>0.43</b>	<b>0.50</b>	<b>0.57</b>	<b>0.74</b>	<b>42.51</b>

Proposed  
 Basin A

SURFACE	AREA	C <sub>2</sub>	C <sub>5</sub>	C <sub>10</sub>	C <sub>100</sub>	%IMP
DRIVES AND WALKS	1.92	0.85	0.87	0.90	0.92	96.00
ROOFS	1.01	0.80	0.85	0.90	0.90	90.00
LAWNS - CLAYEY	1.57	0.10	0.20	0.30	0.60	0.00
<b>TOTAL AREA</b>	<b>4.50</b>	<b>0.58</b>	<b>0.63</b>	<b>0.69</b>	<b>0.80</b>	<b>61.13</b>

**APPENDIX B**

DETENTION POND CALCULATIONS





**Calculate Water Quality Capture Volume**

Reference UDFCD Manual - Volume 3

1. Basin Storage Volume

A. Imperviousness Ratio ( $I = I_a / 100$ )

$I_A = 61.13\%$

$i = 0.611$

B. Contributing Watershed

$A = 4.50$  Acres

C. Water Quality Capture Volume (WQCV)

$WQCV = 1.0 \times (0.91 \times i^3 - 1.19 \times i^2 + 0.78 \times i)$

WQCV = 0.240 in / acre

D. Design Volume

Volume =  $(WQCV / 12) \times \text{Area} \times 1.2$

For Extended Detention type pond

Volume = 0.1079 acre - feet

4,701 cubic feet

**WATER QUALITY CAPTURE VOLUME (WQCV) = 4,701 cubic feet**

**Required Pond Volume for both Water Quality and Detention**

10-year Storm Water Detention Volume

FAA 4,528 cubic feet

100% of required Water Quality Volume

4,701 cubic feet

**Required Total Volume**

9,229 cubic feet

10-year Storm Water Detention Volume

FAA 6,033 cubic feet

50% of required Water Quality Volume

2,351 cubic feet

**Required Total Volume**

8,383 cubic feet

**Larger of the two required Volumes**

9,229 cubic feet

EXISTING 10-YR W.S.E.: 61.12  
 EXISTING 100-YR W.S.E.: 61.42

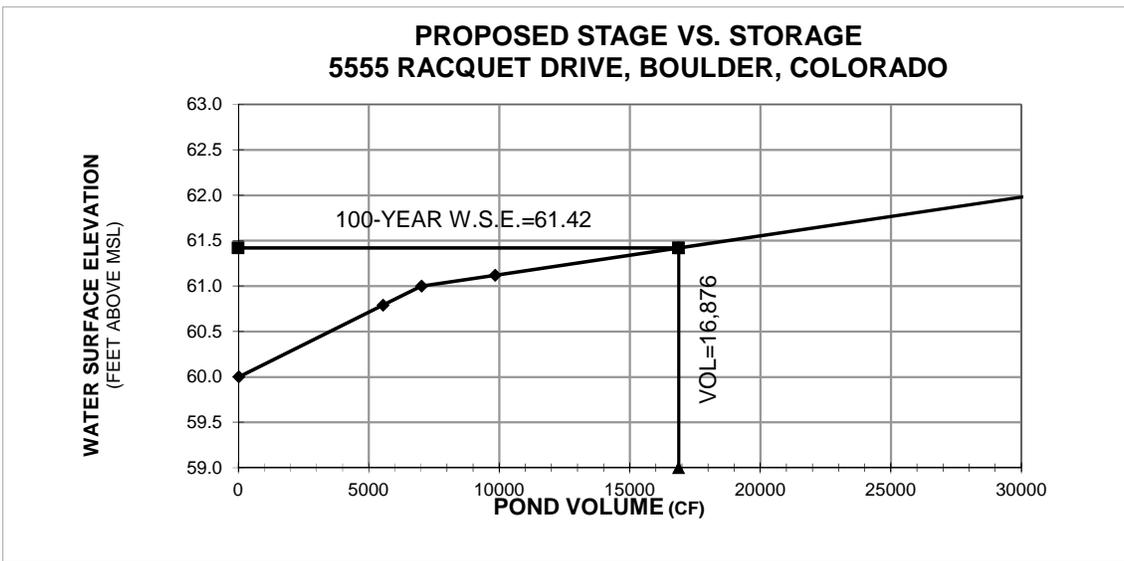
**POND VOLUME CALCULATION**

ELEVATION	DEPTH	AREA S.F.	WEIGHTED AVG AREA S.F.	INCREMENTAL VOLUME C.F.	CUMMULATIVE VOLUME C.F.
59.7		0			
	0.3		68	20	20
60.0		136			
	1.0		7,003	7,003	7,024
61.0		13,871			
	1.0		23,456	23,456	30,480
62.0		33,042			

<b>TOTAL (CUBIC FEET)</b>	<b>30,480</b>
---------------------------	---------------

STAGE/STORAGE		
STAGE(SF)	CUM VOL(CF)	
60.00	20	
60.79	5,553	WQCV
61.00	7,024	
61.12	9,839	10-YEAR
61.42	16,876	100-YEAR
62.00	30,480	

$VOL_{10} + WQCV \text{ REQUIRED} = 9,229CF$



**SCOTT, COX & ASSOCIATES, INC.**  
consulting engineers - surveyors

Project No.: 14536B  
Date: 11/3/2014  
By: MRF

**DETENTION POND**  
**Rectangular Weir Flow Calculations**

**"10-year Release Rate"**

Enter starting **C**, **L**, **H** to calculate Q.

$$Q=C*L*(H^{**1.5})$$

Q=Flow=	<b>10.60</b> CFS
C=Weir Coef.=	<b>2.6</b>
L=Weir Length=	<b>18.12</b> FT
H=Height=	<b>0.370</b> FT

Inv. of Overflow Weir= 10-Year Pond W.S.E.=	<b>5261.12</b>
Top of Wall=	<b>5260.75</b>

**10.60 CFS < 10.86 cfs Allowable Release Rate**

**∴ O.K.**

**SCOTT, COX & ASSOCIATES, INC.**  
consulting engineers - surveyors

Project No.: 14536B  
Date: 11/3/2014  
By: MRF

**DETENTION POND**  
**Rectangular Weir Flow Calculations**

**"100-year Release Rate"**

Enter starting C, L, H to calculate Q.

$$Q=C*L*(H^{1.5})$$

Q=Flow=	<b>9.10</b> CFS
C=Weir Coef.=	<b>2.6</b>
L=Weir Length=	<b>22.4</b> FT
H=Height=	0.290 FT

Inv. of Overflow Weir=100-Year Pond W.S.E.=	<b>5261.42</b>
Top of Wall=	5261.13

**9.10 +10.60 (10YR RELEASE) = 19.7 cfs < 20.86 cfs Allowable Release Rate**

**∴ O.K.**

**SCOTT, COX & ASSOCIATES, INC.**  
consulting engineers - surveyors

Project No.: 14536B  
Date: 11/3/2014  
By: MRF

**DETENTION POND**  
**Rectangular Weir Flow Calculations**

**Emergency Overflow Rate**

Enter starting C, L, H to calculate Q.

$$Q=C*L*(H^{1.5})$$

Q=Flow=	<b>69.45</b> CFS
C=Weir Coef.=	<b>2.6</b>
L=Weir Length=	<b>23.8</b> FT
H=Height=	1.080 FT

Inv. of Overflow Weir=Max Pond W.S.E.=	<b>5262.50</b>
Top of Wall=	5261.42

**61.88 CFS > 41.72 cfs Design Flow**

**∴ O.K.**

**APPENDIX C**

**PREVIOUS DRAINAGE STUDY**

SITE 1

5-YEAR PRELIMINARY DETENTION STORAGE ANALYSIS

DISCHARGE CALCULATIONS		MULTIPLE-TRIANGULAR HYDROGRAPH			VOLUME CALCULATIONS		
	South	North	Time (min)	Discharge (cfs)	South	North	
Pervious (acres)	.32	.51					
Roof (acres)	.05	.10	0	0	0	0	
Slabs (acres)	.04	.12	5	.82	1.70		
C-factor	.35	.41	10	.39	.81		
Time of Concentration	5 min	5 min	15	.27	.56		
Discharge (cfs)	.82	1.70	20	.21	.44		
Release Rate (based on land use)	.22	.42					

DISCHARGE CALCULATIONS		MULTIPLE-TRIANGULAR HYDROGRAPH			VOLUME CALCULATIONS		
	South	North	Time (min)	Discharge (cfs)	South	North	
Pervious (acres)	1.9	1.5					
Impervious (acres)	1.3	3.0	0	0	0	0	
C-factor	.50	.67	5	9.1	17.2		
Time of Concentration	5 min	5 min	10	4.3	8.1		
Discharge (cfs)	9.1	17.2	15	3.0	4.5		
Release Rate (based on land use)	2.2	3.75	20	2.4	3.3		

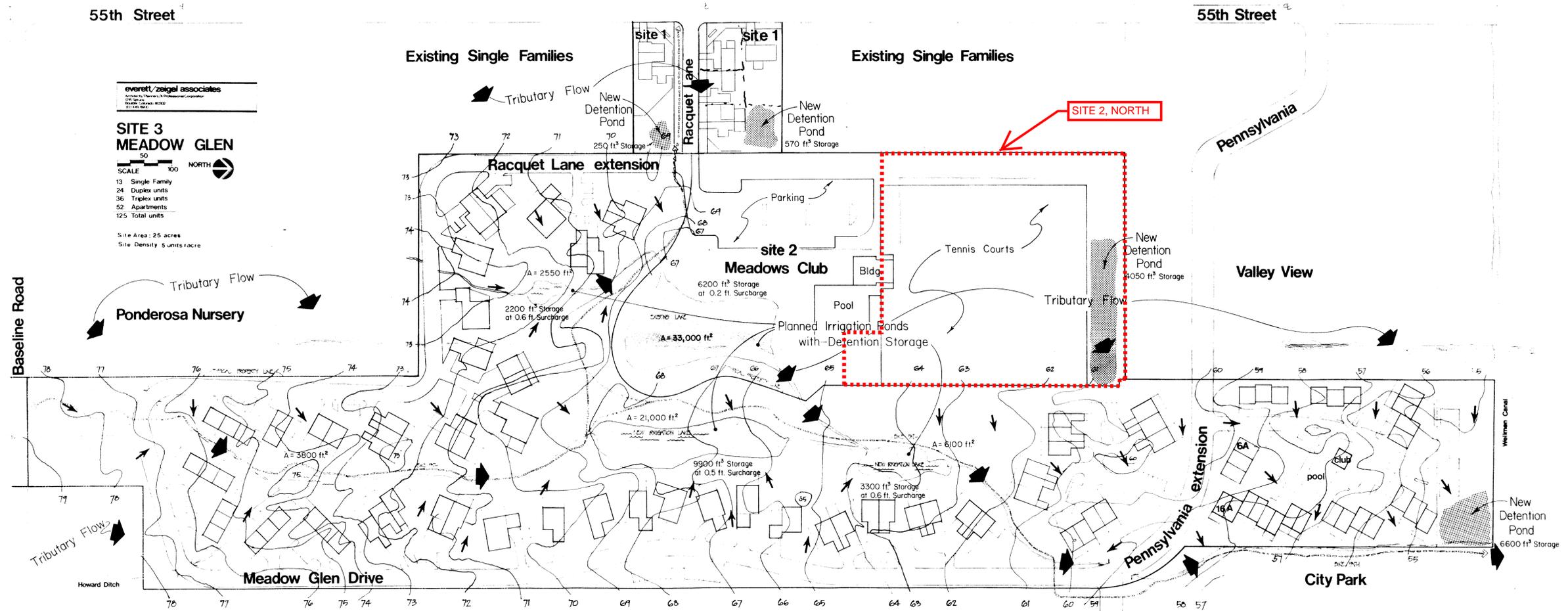
SITE 2

5-YEAR PRELIMINARY DETENTION STORAGE ANALYSIS

DISCHARGE CALCULATIONS		MULTIPLE-TRIANGULAR HYDROGRAPH			VOLUME CALCULATIONS		
	South	North	Time (min)	Discharge (cfs)	South	North	
Pervious (acres)	1.9	1.5					
Impervious (acres)	1.3	3.0	0	0	0	0	
C-factor	.50	.67	5	9.1	17.2		
Time of Concentration	5 min	5 min	10	4.3	8.1		
Discharge (cfs)	9.1	17.2	15	3.0	4.5		
Release Rate (based on land use)	2.2	3.75	20	2.4	3.3		

DISCHARGE CALCULATIONS		MULTIPLE-TRIANGULAR HYDROGRAPH			VOLUME CALCULATIONS		
	South	North	Time (min)	Discharge (cfs)	South	North	
Pervious (acres)	1.9	1.5					
Impervious (acres)	1.3	3.0	0	0	0	0	
C-factor	.50	.67	5	9.1	17.2		
Time of Concentration	5 min	5 min	10	4.3	8.1		
Discharge (cfs)	9.1	17.2	15	3.0	4.5		
Release Rate (based on land use)	2.2	3.75	20	2.4	3.3		



**everett/zeigel associates**  
 Architects/Engineers/Professional Corporation  
 1775 North  
 1775 North  
 1775 North

**SITE 3  
 MEADOW GLEN**

SCALE 1" = 100'  
 NORTH

13 Single Family  
 24 Duplex units  
 36 Triplex units  
 52 Apartments  
 125 Total units

Site Area: 25 acres  
 Site Density: 5 units/acre

SITE 3

5-YEAR PRELIMINARY DETENTION STORAGE ANALYSIS

DISCHARGE CALCULATIONS		MULTIPLE-TRIANGULAR HYDROGRAPH			VOLUME CALCULATIONS		
	Developed	Undeveloped	Time (min)	Discharge (cfs)	Net Runoff	Allowed Release	Required Storage
Pervious	16.5 acres	25 acres	0	0	= 45,000 ft. <sup>3</sup>		
Impervious	8.5 acres	0 acres	15	37.6	= 23,000 ft. <sup>3</sup>		
C-Factor	.44	.2	30	12.5	= 22,000 ft. <sup>3</sup>		
Time of Concentration	15 min.	20 min.					
Discharge	14.7 cfs	37.6 cfs.					

Required storage is shown as surcharge on irrigation ponds distributed in proportion to the area tributary to the pond except at the north end where a pond for detention only adjacent to the drainage way shown is provided. Preliminary plan is subject to changes in irrigation ponds, and economics to be determined during final design phase. Tributary flows, discharge structures and channels to be determined during final design.

NO.	REVISIONS	DATE
1	Site Plan Changes	6-24-76

**NORRIS W. HERMSMEYER**  
**PHILLIP D. GEIL**

**MEADOW GLEN**  
 BOULDER, COLORADO

**PRELIMINARY  
 DRAINAGE PLAN**

McDOWELL, SCOTT & COX, INC.		
BOULDER, COLORADO		
DESIGN BY <u>E.L.S.</u>	DATE <u>5-13-76</u>	SHEET <u>  </u> OF <u>  </u>
DRAWN BY <u>chs</u>	SCALE <u>1" = 100'</u>	DRAWING NO. <u>76124</u>
CHECKED BY <u>  </u>		

### LEGEND

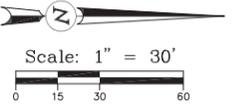
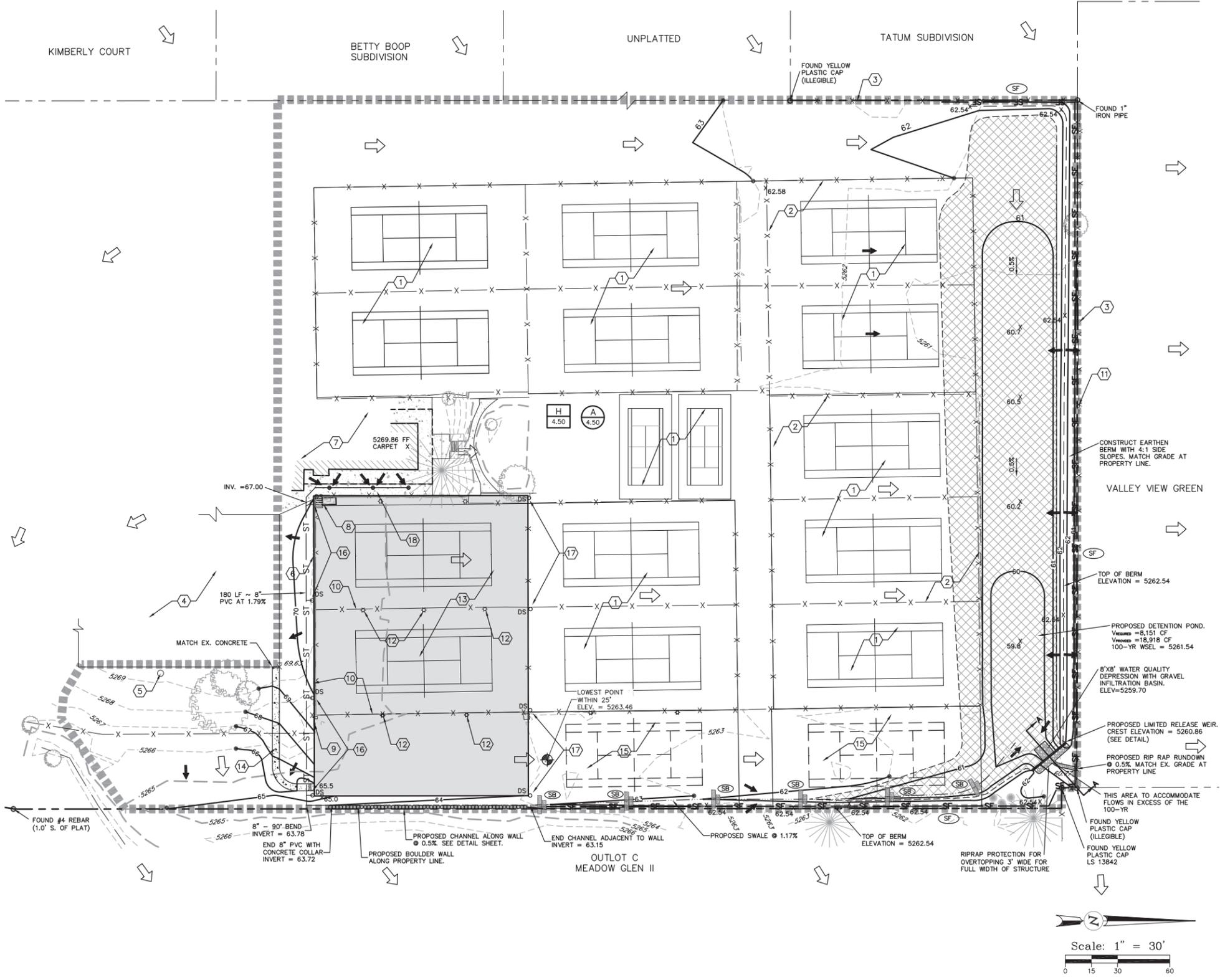
- EXISTING DECIDUOUS TREE
- EXISTING PINE TREE
- EXISTING CONTOUR
- EXISTING SWALE
- FOUND MONUMENT AS NOTED
- EXISTING LIGHT POLE
- EXISTING FENCE
- PROPOSED CONTOUR  
ADD 5200 TO ALL CONTOURS
- POINT WHERE PROPOSED GRADE  
MEETS EXISTING GRADE
- PROPOSED SPOT ELEVATION  
ADD 5200 TO ALL SPOT ELEVATIONS
- EXISTING SPOT ELEVATION
- HISTORIC SHEET FLOW
- PROPOSED FLOW DIRECTION
- PROPOSED DOWNSPOUT
- PROPOSED BASIN BOUNDARY
- SUB-BASIN DESIGNATION (HISTORIC)
- AREA IN ACRES
- PROPOSED SUB-BASIN DESIGNATION
- AREA IN ACRES
- SILT FENCE (SF)
- PROPOSED DETENTION POND
- PROPOSED STRAW BALE BARRIER (SB)

### GRADING NOTES

- GRADE AWAY FROM BUILDINGS AT A MINIMUM 10% SLOPE IN THE FIRST 10 FEET AT LANDSCAPE AREAS AND AT A MINIMUM 2% SLOPE IN THE FIRST 10 FEET AT IMPERVIOUS AREAS, EXCEPT AS NOTED.
- TOP OF FOUNDATION ELEVATION SHALL BE SET AT LEAST 0.5' ABOVE THE PROPOSED GRADING AT THE EXTERIOR OF THE FOUNDATION AT LANDSCAPE AREAS.
- THIS GRADING, DRAINAGE AND EROSION CONTROL PLAN IS BASED ON THE PRELIMINARY PUD DRAINAGE PLAN PREPARED BY MCDOWELL, SCOTT & COX, INC. DATED 05/13/76. THE PROPOSED DETENTION POND LOCATION AND DRAINAGE PATTERNS ARE BASED ON THESE PLANS. THE SITE IS CURRENTLY DEVELOPED WITH SEVERAL DETENTION/IRRIGATION PONDS THAT PROVIDE STORM WATER DETENTION FOR THE ENTIRE SUBDIVISION. THE INTENT OF THESE PLANS IS TO PROVIDE DETENTION STORAGE FOR THE SITE BASED ON THE APPROVED PUD PLANS.
- BENCH MARK: (CITY OF BOULDER W-3-1) CHISELED "L" IN THE TOP OF A CURB ON THE EAST SIDE OF BOXWOOD LANE NEAR 921 BOXWOOD LANE, LOCATED AT THE SOUTHWEST CORNER OF A SIDEWALK AND PEDESTRIAN CROSSING. ELEVATION = 5267.62 (CITY OF BOULDER DATUM).
- THIS TOPOGRAPHIC SURVEY IS NOT AN "IMPROVEMENT SURVEY PLAT OR "LAND SURVEY PLAT". NO BOUNDARY DETERMINATIONS HAVE BEEN MADE, OR TITLE SEARCHES PREPARED.
- THE LOCATION OF THE ABOVE GROUND UTILITIES SHOWN HEREON ARE BASED ON THE FIELD SURVEY BY SCOTT, COX & ASSOCIATES, INC. THE LOCATIONS OF THE UNDERGROUND UTILITIES SHOWN HEREON ARE BASED ON SAID SURVEY AND INFORMATION PROVIDED BY OTHERS (WHICH MAY INCLUDE THE UTILITY OWNER OR UTILITY LOCATING SERVICES). SCOTT, COX & ASSOCIATES, INC. IS NOT RESPONSIBLE FOR UTILITY INFORMATION PROVIDED BY OTHERS. SCOTT, COX & ASSOCIATES, INC. RECOMMENDS THAT THE LOCATION OF THE UTILITIES BE FIELD VERIFIED PRIOR TO ANY DIGGING ON, OR ADJACENT TO THE SUBJECT PROPERTY.
- THIS DRAWING IS BASED ON A FIELD SURVEY COMPLETED ON 01/26/10.

### KEYED NOTES

- EXISTING COURTS TO REMAIN. (TYP.)
- EXISTING CHAIN LINK FENCE TO REMAIN. (TYP.)
- EXISTING WOOD FENCE TO REMAIN.
- EXISTING POOL TO REMAIN.
- EXISTING SUMP PUMP TO REMAIN.
- EXISTING CONCRETE WALL TO REMAIN.
- EXISTING CLUBHOUSE TO REMAIN.
- EXISTING EQUIPMENT SHED AND WOOD STEPS TO BE REMOVED.
- EXISTING ELECTRICAL SWITCH BOX TO BE RELOCATED.
- EXISTING FENCE TO BE REMOVED.
- EXISTING UTILITY PEDESTAL TO REMAIN.
- EXISTING LIGHT POLES TO BE REMOVED.
- PROPOSED METAL BUILDING.
- PROPOSED 4' CONCRETE SIDEWALK. 2% MAX CROSS SLOPE.
- FUTURE TENNIS COURTS TO BE CONSTRUCTED AT A LATER DATE.
- CONNECT PROPOSED ROOF DRAIN DOWNSPOUTS INTO 8" PVC STORM PIPE.
- DISCHARGE PROPOSED ROOF DRAIN DOWNSPOUTS AT GRADE.
- THREE (3) 9" ZURIN INLETS Z550 WITH 8" PVC PIPE AT 2.0% RIM ELEVATION = 69.50±. PROVIDE NEW SIDEWALK BETWEEN CLUBHOUSE AND NEW BUILDING WITH 2% SLOPE INTO DRAINS.



### DETENTION POND TABLE

EVENT	VOLUME REQUIRED	VOLUME PROVIDED	WS ELEVATION	RELEASE RATE
WQCV	4,302 CF	8,974 CF	5260.86	0 CFS
10YR +100% WQCV	8,151 CF	14,132 CF	5261.23	10.84 CFS
100YR +50% WQCV	7,611 CF	18,918 CF	5261.54	20.86 CFS



**SCOTT, COX & ASSOCIATES, INC.**  
consulting engineers • surveyors  
1530 55th Street • Boulder, Colorado 80303  
(303) 444 - 3051

PROJECT No: \_\_\_\_\_  
DATE: 2-10-10  
REVISED:  
SHEET TITLE: GRADING, DRAINAGE AND EROSION CONTROL PLAN  
SHEET NUMBER:

**LEGEND**

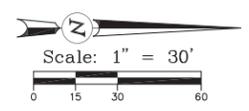
-  EXISTING DECIDUOUS TREE
-  EXISTING PINE TREE
-  EXISTING CONTOUR
-  FOUND MONUMENT AS NOTED
-  EXISTING WATER VALVE
-  EXISTING GAS METER
-  CONTROL POINT
-  EXISTING LIGHT POLE
-  EXISTING SIGN
-  EXISTING FIRE HYDRANT
-  EXISTING FENCE
-  PROPOSED CONTOUR  
ADD 5200 TO ALL CONTOURS
-  POINT WHERE PROPOSED GRADE  
MEETS EXISTING GRADE
-  PROPOSED SPOT ELEVATION  
ADD 5200 TO ALL SPOT ELEVATIONS
-  EXISTING SPOT ELEVATION
-  HISTORIC SHEET FLOW
-  PROPOSED FLOW DIRECTION
-  DRAINAGE BASIN BOUNDARY (HISTORIC)
-  PROPOSED BASIN BOUNDARY
-  SUB-BASIN DESIGNATION (HISTORIC)
-  AREA IN ACRES
-  PROPOSED SUB-BASIN DESIGNATION
-  AREA IN ACRES
-  PROPOSED DETENTION POND
-  FF

**KEYED NOTES** ①

1. PROPOSED INDOOR TENNIS COURTS.
2. PROPOSED TENNIS COURTS.
3. PROPOSED PLATFORM TENNIS COURTS TO REPLACE EXISTING TENNIS COURTS.
4. EXISTING TREES TO BE REMOVED.
5. PROPOSED CLUBHOUSE.
6. PROPOSED 7' SCREEN WALL. SEE ARCHITECTURAL PLANS.
7. PROPOSED GAZEBO.
8. PROPOSED 4" CONCRETE PAN.
9. RAISE BERM TO ELEVATION 5262.54 FOR 12" FREEBOARD.
10. EXISTING WATER QUALITY STRUCTURE AND DETENTION OUTLET STRUCTURE TO REMAIN.
11. EXISTING 12" PVC STORM FRO ROOF DRAINS TO REMAIN. DISCHARGE INTO NEW CONCRETE PAN.

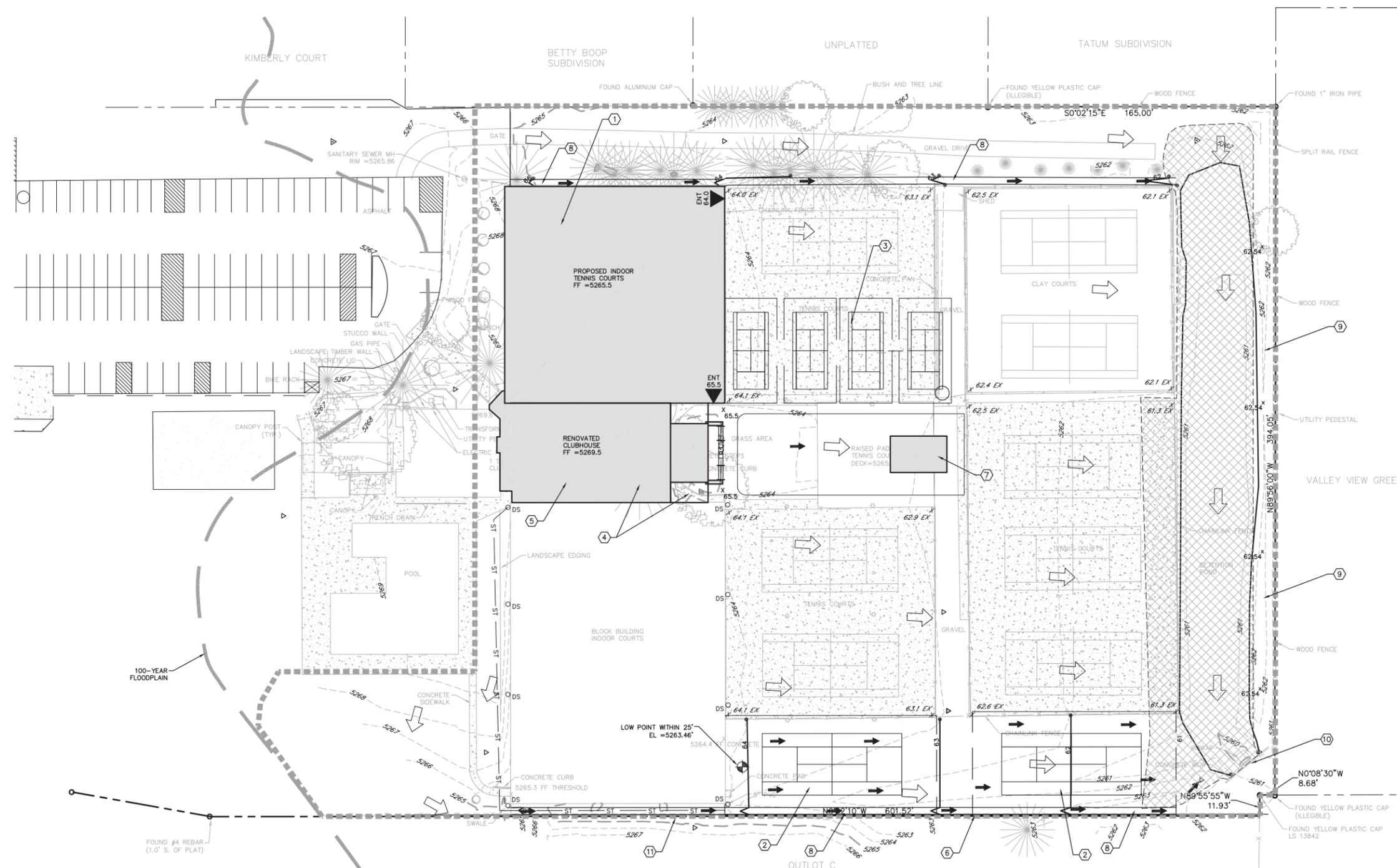
**GRADING NOTES**

1. GRADE AWAY FROM BUILDINGS AT A MINIMUM 10% SLOPE IN THE FIRST 10 FEET AT LANDSCAPE AREAS AND AT A MINIMUM 2% SLOPE IN THE FIRST 10 FEET AT IMPERVIOUS AREAS, EXCEPT AS NOTED.
2. TOP OF FOUNDATION ELEVATION SHALL BE SET AT LEAST 8" ABOVE THE PROPOSED GRADING AT THE EXTERIOR OF THE FOUNDATION AT LANDSCAPE AREAS.
3. THE FEMA FLOOD INSURANCE RATE MAP, PANEL 080130D413J, DATED DECEMBER 18, 2012, INDICATES THAT PORTIONS OF THE SITE ARE LOCATED WITHIN ZONE AE, AREAS SUBJECT TO INUNDATION BY THE 1% ANNUAL CHANCE FLOOD.
4. ALL CITY UTILITIES SHALL BE CONSTRUCTED IN ACCORDANCE WITH THE CITY OF BOULDER STANDARD SPECIFICATIONS.
5. THE LOCATION OF THE ABOVE GROUND UTILITIES SHOWN HEREON ARE BASED ON THE TOPOGRAPHIC SURVEY BY SCOTT, COX AND ASSOCIATES ON 10/21/14. THE LOCATIONS OF THE UNDERGROUND UTILITIES SHOWN HEREON ARE BASED ON SAID SURVEY AND INFORMATION PROVIDED BY OTHERS (WHICH MAY INCLUDE THE UTILITY OWNER OR UTILITY LOCATING SERVICES). SCOTT, COX & ASSOCIATES, INC. IS NOT RESPONSIBLE FOR UTILITY INFORMATION PROVIDED BY OTHERS. SCOTT, COX & ASSOCIATES, INC. RECOMMENDS THAT THE LOCATION OF THE UTILITIES BE FIELD VERIFIED PRIOR TO ANY DIGGING ON, OR ADJACENT TO THE SUBJECT PROPERTY.
6. BENCH MARK: (CITY OF BOULDER W-3-1) CHISELED "L" IN THE TOP OF A CURB ON THE EAST SIDE OF BOXWOOD LANE NEAR 921 BOXWOOD LANE, LOCATED AT THE SOUTHWEST CORNER OF A SIDEWALK AND PEDESTRIAN CROSSING. ELEVATION = 5267.62 (CITY OF BOULDER DATUM).
7. A FINAL STORMWATER PLAN AND REPORT IS REQUIRED BY THE CITY OF BOULDER PRIOR TO ISSUANCE OF A BUILDING PERMIT.



**DETENTION POND TABLE**

EVENT	VOLUME REQUIRED	VOLUME PROVIDED	WS ELEVATION	RELEASE RATE
WQCV	4,701 CF	5,553 CF	5260.79	0 CFS
10YR +100% WQCV	9,229 CF	9,839 CF	5261.12	10.86 CFS
100YR +50% WQCV	8,383 CF	16,876 CF	5261.42	20.86 CFS



**SCOTT, COX & ASSOCIATES, INC.**  
consulting engineers • surveyors  
1530 55th Street • Boulder, Colorado 80303  
(303) 444-3051