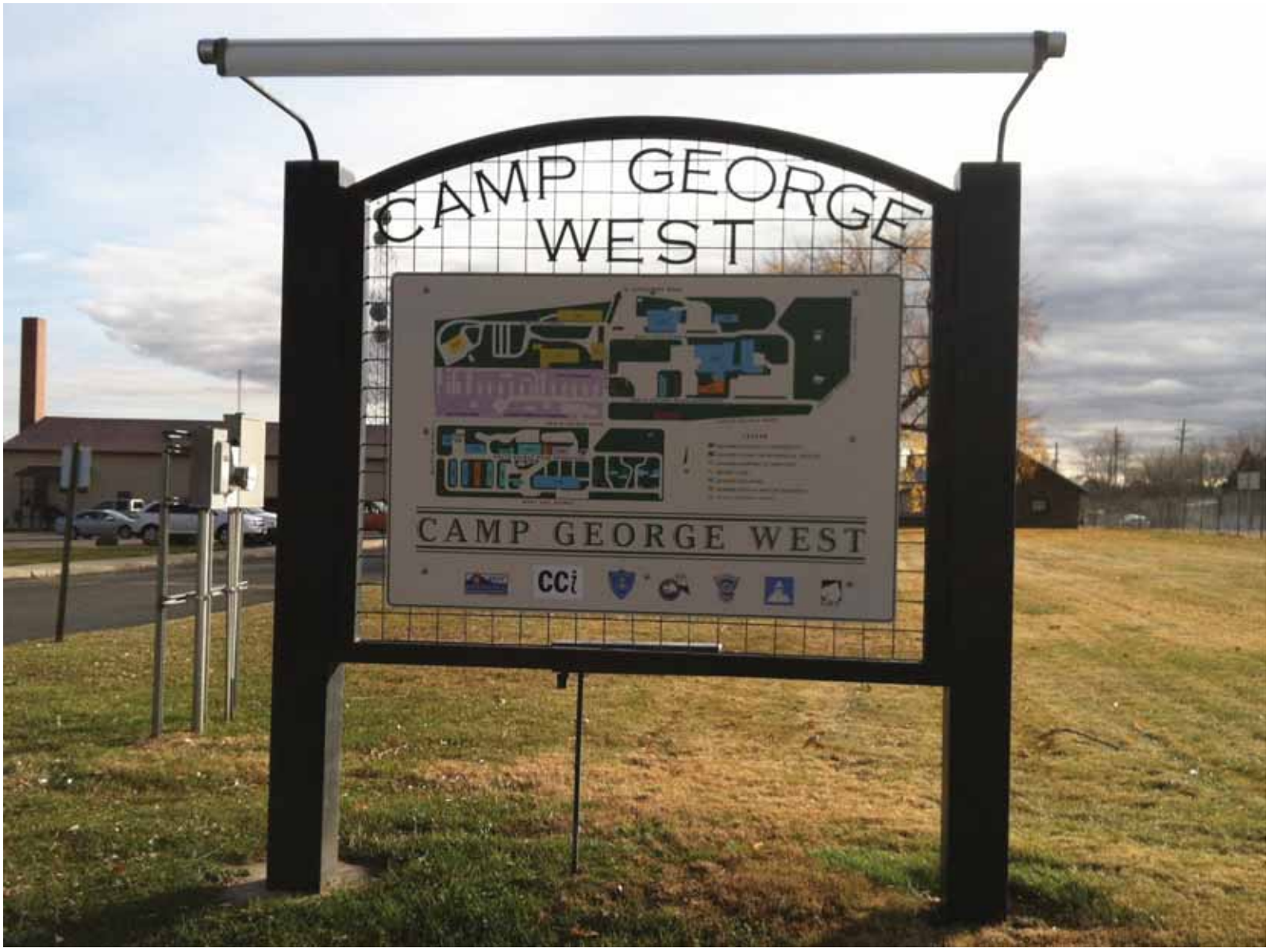
CAPITOL COMPLEX MASTER PLAN

FINDINGS & RECOMMENDATIONS (F & R) NEEDS ASSESSMENT

CAMP GEORGE WEST, 15000 SOUTH GOLDEN ROAD (PLEASANT VIEW)

NOVEMBER 2014



RNL

FINDINGS & RECOMMENDATIONS (F&R) NEEDS ASSESSMENT

CAMP GEORGE WEST
15000 SOUTH GOLDEN ROAD (PLEASANT VIEW)

November 2014

TABLE OF CONTENTS

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EXECUTIVE SUMMARY

The purpose of this report is to provide a Findings & Recommendations (F&R) Needs Assessment of the Camp George West site at 15000 South Golden Road in Pleasant View, Colorado, approximately 3 miles east of the City of Golden. The report includes a description and evaluation of the existing conditions, recommendations, and cost estimates for the recommended work from the following focus areas: civil (Martin/Martin Consulting Engineers), electrical (RMH Group), and cost estimating (CBRE, Inc.). The project team, led by RNL, reviewed existing site documentation, drawings, and audit reports provided by the Owner, and conducted a site visit to identify and document the observable existing conditions of the site and its code and life safety issues.

Originally established in 1903 as the State Rifle Range, the post developed over the years and was designated Camp George West in 1934. The Camp George West site was placed on the Historic Register as the Camp George West Historic District on February 11, 1993 and contributes to the architectural history of the State of Colorado. All work on the property should follow the Secretary of the Interior's Standards for the Treatment of Historic Properties and the National Park Service (NPS) Preservation Briefs. In general the site is in poor condition. A poor condition rating refers to the fact that the Camp George West site is in urgent need of repairs to address life safety and loss of use/reliability issues.

Although all recommendations presented in this report should be considered for implementation, the following are the top five priorities due to their impact on life safety (LS), loss of use/reliability (LOU), finishes (F), and overall energy efficiency:

1. Assessment of underground utilities. This recommendation encompasses loss of use/reliability issues.

   High Level Cost Estimate: $332,779

2. Add additional site lighting. This recommendation encompasses life safety issues and is due to areas of the site without any lighting and inadequate site lighting along roadways, parking lots, and storage areas.

   High Level Cost Estimate: $633,895

3. Repair/replace broken and cracked concrete on site. This recommendation encompasses life safety and loss of use/reliability issues and is due to the overall deterioration of the site pavement which is creating a potential tripping hazard.

   High Level Cost Estimate: $2,125,156

4. Drainage improvements. This recommendation encompasses loss of use/reliability issues and is due to problems with local flooding occurring on-site and the flooding of numerous existing structures during minor storm events.

   High Level Cost Estimate: $3,533,749

5. Repair/replace site asphalt. This recommendation encompasses life safety and loss of use/reliability issues and is due to the overall deterioration of the site pavement which is creating a potential tripping hazard.

   High Level Cost Estimate: $5,406,945

If all recommendations in this report are implemented as a single project, including the top 5 priorities, the high level cost estimate is:

$13,847,708

If all recommendations in this report are implemented system by system as multiple projects, including the top 5 priorities (systems), the high level cost estimate is:

$14,697,457

1.0 OVERVIEW

1.O-A CIVIL OVERVIEW

The Camp George West site is approximately 289.78 acres and is located at 15000 South Golden Road in Golden, Colorado. The existing historic site functions as a correctional facility, police training academy and emergency operations center and consists of buildings, site landscaping, parking lots, sidewalk and utilities. The condition of the site surrounding is consistent with a development with an estimated age of 100+ years.

The site exterior is generally in poor condition. There are numerous locations around the building with broken and cracked concrete and asphalt in need of repair or replacement. Broken concrete in walking paths is a tripping hazard and a high safety concern. The main concern regarding the site is drainage. Numerous existing structures experience flooding in minor storm events. Drainage improvements should be made a priority to protect the existing historic site and downstream facilities and ensure site longevity.

1.0-B ELECTRICAL OVERVIEW

The electrical assessment of the Camp George site included review of the existing site documentation, drawings, and audit reports provided by the Owner. A site survey was performed to observe the existing electrical equipment and assess code and building energy efficiency issues. During the site survey, information about the building history and on the electrical systems conditions, maintenance routines, and installation dates.

The main concern with this site is the need for more automatic lighting controls, the number of fixtures, and using more LED fixtures. Automatic lighting controls would ensure no energy is wasted by the lights. Automatic lighting controls can include motion sensors, day lighting sensors, time clock, and advanced lighting controls via lighting panels. The site needs better lighting distribution for a more even light output and consistent light. Also LED fixtures can use less power per square foot than other lighting sources.

Energy Conservation

One way to conserve energy would be to use LED light fixtures with motion sensor detection to dim the lights to half brightest when no one is around. Also, using advanced controls would allow the staff to know when a light is out and needs replacement.

2.0 OVERALL SITE ASSESSMENT FINDINGS AND RECOMENDATIONS

2.1 CIVIL

2.1-A EXTERIOR BUILDING ENVELOPE/SITE

General

The Camp George West site is located east of South Golden Road and Research Road at 15000 South Golden Road in Golden, Colorado. The Pleasant View residential area is located to the west and south of the site. Office and retail development is located to the east. The National Renewable Energy Laboratory and Pleasant View Park are located to the north of the site. An Interstate 70 overpass borders the southwest corner of the site. The site originated as a military rifle range in 1903 and developed into a military base for the Colorado National Guard (Fig. 2.1.A.1). Camp George West is now owned and managed by The Colorado Department of Personnel and Administration/ Capitol Complex Facilities and functions as a correctional facility, police training academy and emergency operations center. The site totals 289.78 acres with 64 buildings (Fig. 2.1.A.3) including a bunker and amphitheater. A majority of the site acreage encompasses a police training track located at South Table Mesa (Fig. 2.1.A.4). This report focuses on the infrastructure contained within the main, developed 50 acres of Camp George West, located both north and south of South Golden Road.

Camp George West was added to the National Register of Historic Places in 1993 as a historical district. The buildings and infrastructure on site range from approximately 70 years old to over 100 years old.

Figure 2.1.A.1 – Camp George West in 1916, copyright Jefferson County Historical Society.

Figure 2.1.A.2 – Camp George West Site Map & Entrance

Figure 2.1.A.3 – Camp George West Structures

Figure 2.1.A.4 – Police Training Track

Lena Gulch, a major drainage way and channel runs along the northern portion of the site with a reach along the east (Fig. 2.1.A.5) Site elevations vary from approximately 5,740 feet to 6,225 feet.

Figure 2.1.A.5 – Lena Gulch, East Reach

NOTE: Descriptions of existing infrastructure contained herein are based on public utility information provided by the State of Colorado, Consolidated Mutual Water Company and Pleasant View Sanitation District. Unless noted otherwise, no detailed survey information was reviewed as part of this site analysis. Estimates of drainage patterns, site grades, and slopes are based upon visual observation or information provided by others, ie. U.S. Geological Survey (USGS).

Grading and Drainage

The site slopes generally from southwest to northeast. The high point of the site is at the southeast corner of McIntyre Street and West 10th Avenue, near Building #58. The site generally consists of gentle to moderate slopes, ranging from 2.0-percent to 6.0-percent. The majority of the site runoff is conveyed by surface flow with localized ponding experienced at a number

of the buildings. The west side of the site sheet flows northeasterly to Lena Gulch near Building #11. The east side of the site drains overland northeasterly to the eastern reach of Lena Gulch. The eastern reach of Lena Gulch and Welch Ditch merge with Lena Gulch northeast of the site. The site appears to accept off-site runoff from the south residential area. The extent of runoff is unknown at this time, as the off-site area was not analyzed as a part of this report.

The overall site consists of the existing buildings, asphalt roadways (Fig. 2.1.A.6), concrete sidewalks, and landscaped areas of grasses and trees. There is a gravel parking area for army vehicle storage and four large asphalt parking areas. The overall site imperviousness is estimated at 71-percent.

Figure 2.1.A.6 – Site Asphalt Roadways

The developed 50 acre site generates an estimated total runoff of 235.48 cubic feet per second, all tributary to Lena Gulch. There is very little storm sewer on-site, so a majority of the runoff drains overland and collects at localized low spots, including along building foundations (Fig. 2.1.A.7). The storm sewer is not mapped through the Camp George site, but a description of storm conveyances features and photos can be found in the Utility Services portion of this assessment. Runoff calculations and map can be found in the Appendix.

Figure 2.1.A.7 – Evidence of Local Ponding

The effective Flood Insurance Rate Map (FIRM Map Number 08059C0281E, effective date June, 17, 2003) shows the property lies within Zone X, areas designated as outside of the 500-year floodplain. Although local flooding occurs on-site, flooding from Lena Gulch does not spill into Camp George West.

Utility Services

Domestic water is provided to Camp George West by Consolidated Mutual Water Company. Individual building water demands are unknown at this time. It was reported that there was a buried gas tank for the military gas

station at the Camp George West site. This tank is thought to no longer be in place. At one time, water lines on-site were replaced with gas lines instead of water pipes. There are existing test wells for water on the site and it is understood that the current water has tested safe. Remediation was conducted in the past but we of the understanding that it is no longer necessary. It was reported that there is an ongoing well project a Camp George West.

It appears that there are two site wells and a water vault (Fig. 2.1.A.10). The water system appears to be a complex loop of lines that supply all of the buildings on-site. The pipe sizes within the site are unknown. Along the perimeter of the site, the water main that is within West 10th Avenue is 8-inches in size. Within South Golden Road, the main is 6-inches. There are two parallel lines within Isabell Street, a 4-inch to the west and a 12-inch to the east. The Camp George supply appears to be a 4-inch private line off the 4-inch westerly Isabell line. A minimum of 10 fire hydrants were observed on-site. There are no known water pressure problems at this time but it is understood that there are between 2 and water service problems per year. It is recommended that the gas lines used as water lines be replaced with DIP, PVC or similar materials for water piping current with Consolidated Mutual Water Company standards to ensure clean water delivery. It is also recommended that the locations of service problems be identified and those lines be repaired and or replaced. The existing water lines should be monitored, inspected, and maintained regularly.

Figure 2.1.A.8 – Water Manhole

Figure 2.1.A.9 – Water Meter

Figure 2.1.A.10 – Water Vault

The sanitary sewer service for Camp George West is provided by Pleasant View Metropolitan District. On-site sanitary sewer maps have been provided by the State. The individual buildings are served by sanitary sewer lines approximately 4 to 15 feet in depth. The site sewer appears to discharge to an 8-inch main at the north end of the site north of Building #105. The existing line is old and has numerous problems including root damage, gravel and/or grease buildup, flat slopes, and stagnant water. An additional concern regarding the sanitary sewer at Camp George is several lines running under buildings, specifically Building #45 and Building #105. It is understood that there is an average of 2 sanitary sewer problems per year. It is recommended that existing sanitary sewer be replaced with new pipe, meeting current Pleasant View Metropolitan District material standards.

Any sanitary sewer mains located under structures should be relocated outside of the building footprint. The existing sanitary sewer lines should be monitored, inspected, and maintained regularly.

Existing storm sewer is not mapped at Camp George. Existing storm sewer conveyance elements include curb and gutter, trench drains, curb cuts, roof drains, culverts, small channels, and area drains (Figs. 2.1.A.11 through 2.1.A.19). Existing storm sewer should be regularly cleaned to prevent clogging and overflow and to the limit the discharge of pollutants to and erosion of downstream receiving waters.

Figure 2.1.A.11 – Trench Drain near Building #47

Figure 2.1.A.12 – Curb Cut through Sidewalk near Building #120

Figure 2.1.A.13 – Trench Drain and Sandbags at Building #97

Figure 2.1.A.14 – Area Drain near Building #67

Figure 2.1.A.15 – Area Drain near Building #82

Figure 2.1.A.16 – Concrete Pan

Figure 2.1.A.17 – Drainage Channel/ Culvert System

Figure 2.1.A.18 – Small Culvert in Roadway

Figure 2.1.A.19 – Roof Drains

Existing dry and regulated utilities (electric and telecommunications) are assumed to be located in South Golden Road, Isabell Street, and West 10th Avenue.

Recommendations:

- Replace gas lines used as water lines with current water materials.
- Identify locations of service line problems and repair/replace as necessary.
- Regularly monitor, inspect and maintain all existing water, sanitary sewer, and storm sewer lines.
- Replace existing sanitary sewer with new pipe where service problems exist.
- Relocate sanitary sewer mains currently located under structures.
- Regularly clean and de-clog storm sewer lines.

Site Paving

Numerous locations of broken concrete, concrete settling and concrete cracking was observed (Figs. 2.1.A.20 through 2.1.A.23). Large cracks through walking paths can create tripping hazards. Repair or replace broken or cracked concrete.

Figure 2.1.A.20 – Broken Curb

Figure 2.1.A.21 – Site Concrete Crack

Figure 2.1.A.22 – Site Concrete Crack

Figure 2.1.A.23 – Sidewalk Cracking

The site asphalt was noted to be in very poor condition (Figs. 2.1.A.24 through 2.1.A.33). Rutting, potholes, and cracking were observed. In some locations, asphalt has degraded to the extent of showing aggregates. A few locations were observed where the thickness of the asphalt exceeded the height of the surrounding gutters (Fig. 2.1.A.24). Asphalt in this condition creates a tripping hazard and causes concern for drainage conveyance, pavement strength, and asphalt longevity. Cracks can be sealed with bituminous crack sealer but it is recommended that the entire site be re-paved with proper compaction and potentially re-graded to improve the condition of the site asphalt.

Figure 2.1.A.24 – Asphalt Thickness above Gutter

Figure 2.1.A.25 – Asphalt Thickness above Gutter

Figure 2.1.A.26 – Asphalt Cracking near Building #120

Figure 2.1.A.27 – Asphalt Cracking near Building #120

Figure 2.1.A.28 – Uneven Asphalt and Sealed Cracks

Figure 2.1.A.29 – Broken Asphalt in Poor Condition

Figure 2.1.A.30 – Poor Asphalt Condition in Drive Isles

Figure 2.1.A.31 – Uneven, Patched Asphalt

Figure 2.1.A.32 – Poor Asphalt Condition in Parking Area

Figure 2.1.A.33 – Poor Asphalt Condition in Drive Aisle

Recommendations:

- Concrete cracks approximately 1/8” wide or smaller showing no differential movement can be sealed using an approved joint sealant. Cracks should be routed and cleaned per an approved industry method prior to sealing.
- Concrete panels showing numerous excessive cracking and/or differential movement should be replaced.
- Replacement of concrete shall be completed in full stone segments, i.e. to the nearest joint location. Repair the subgrade materials and place new curb & gutter or sidewalk. Replace backfill materials and repair/replace any landscaping/paving disturbed during repair operations.
- Seal asphalt cracks with bituminous crack sealer and/or re-pave areas of asphalt to include proper compaction. Re-grade site for drainage as necessary.

2.1-B CODE ISSUES

Site slopes were analyzed by visual inspection and topography was evaluated using USGS data. It appears that the site slopes and overall site grading are causing the drainage problems experienced. Current geotechnical recommendations and standard practice for slopes away from buildings are 10:1 for 10 feet and 2% in hardscape areas. In many cases, the slopes away from the buildings are flat (Fig. 2.1.B.1). In some cases, the buildings are set below the surrounding grades (Fig. 2.1.B.2).

Figure 2.1.B.1 – Flat Grades Away From Building

Figure 2.1.B.2 – Building Finished Floor lower than Surrounding Grade

It is understood that Camp George improvements are limited and difficult due to the historical status. Despite the complex nature of the historical

status, drainage improvements are highly suggested to preserve the existing site and limit future flooding damage. There are numerous improvements suggested for the Camp George site. Analysis of the off-site drainage from the residential area to the south is recommended along with potential installation of proper drainage conveyances within or along West 10th Avenue to ensure Camp George is not receiving excess runoff from the off-site area. Site landscaping around the individual buildings can be re-graded to current Geotechnical recommendations with area drains installed at low points. Additional trench drains could be installed in low areas in walking paths to prevent icing and concrete or asphalt cracking. Landscaped features such as bio-retention swales can be installed to direct runoff away from structures and promote soil infiltration in strategic locations. Pans can be installed in parking or asphalt areas to direct runoff away from structures. Underdrains and perimeter drains could be considered as an option around existing structures. Finally, it was noted that roof drains are discharging near the building foundations. It is recommended that these drains be extended 5-10 feet away from building foundations or concrete splash blocks installed to prevent excess water from saturating the existing foundations.

Recommendations:

- Re-grade landscaped areas around existing buildings to current Geotechnical recommendations for slopes away from the building.
- Install area drains or trench drains where proper slopes away from the building cannot be met.
- Install swales or pans to direct runoff to proper locations.
- Direct roof drain outfalls to 5-10 feet away from building foundations ir install concrete splash blocks.

2.1-C PLANNED AND ON-GOING PROJECTS

There are no known site planned and on-going projects at this time.

2.1-D APPENDIX AND SUPPORTING DOCUMENTS

DRAINAGE

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DECEMBER 6, 2013

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CONSULTING ENGINEERS
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LAKEWOOD, CO 80215
303.431.6100
FAX 303.431.4028

DRAWING LOCATION: G:\SCHLAGETER\13.0535–State of Colorado Capitol Master Plan\ENG\MP Assessments\Camp George West\drainage map.dwg

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PROJECT INFORMATION

PROJECT NAME:	Camp George West
PROJECT NO:	13.0595
DESIGN BY:	K.ALLEGAR
REVIEWED BY:	M.LORENGER
JURISDICTION:	Lakewood
REPORT TYPE:	Substantiation Calcs
DATE:	12.3.2013

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JURISDICTIONAL STANDARD	C2	C5	C10	C100	% IMPERV
LANDSCAPE	0.10	0.20	0.30	0.60	0%
ROOF	0.80	0.80	0.85	0.90	90%
ASPHALT/CONCRETE	0.87	0.88	0.90	0.93	100%
DRIVES AND WALKS	0.85	0.87	0.90	0.92	95%

TOTAL SITE COMPOSITE	50.00	0.62	0.67	0.70	0.80	70.7%

SUB-BASIN	SURFACE CHARACTERISTICS	AREA (ACRES)	COMPOSITE RUNOFF COEFFICIENTS C2	C5	C10	C100	PERCENT IMPERVIOUSNESS
EX-1		4.75	0.60	0.65	0.70	0.80	70%
SUB-BASIN COMPOSITE		4.75	0.60	0.65	0.70	0.80	70.0%

SUB-BASIN	SURFACE CHARACTERISTICS	AREA (ACRES)	COMPOSITE RUNOFF COEFFICIENTS C2	C5	C10	C100	PERCENT IMPERVIOUSNESS
EX-2		16.75	0.75	0.80	0.80	0.85	80%
SUB-BASIN COMPOSITE		16.75	0.75	0.80	0.80	0.85	80.0%

SUB-BASIN	SURFACE CHARACTERISTICS	AREA (ACRES)	COMPOSITE RUNOFF COEFFICIENTS C2	C5	C10	C100	PERCENT IMPERVIOUSNESS
EX-3		4.50	0.22	0.30	0.38	0.57	30%
SUB-BASIN COMPOSITE		4.50	0.22	0.30	0.38	0.57	30.0%

SUB-BASIN	SURFACE CHARACTERISTICS	AREA (ACRES)	COMPOSITE RUNOFF COEFFICIENTS C2	C5	C10	C100	PERCENT IMPERVIOUSNESS
EX-4		3.26	0.66	0.68	0.71	0.79	85%
		20.74	0.60	0.65	0.70	0.80	70%
SUB-BASIN COMPOSITE		24.00	0.61	0.65	0.70	0.80	72.0%

TOTAL SITE COMPOSITE	50.00	0.62	0.67	0.70	0.80	70.7%

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COMPOSITE_C-VALUES
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CALCULATED BY: K.ALLEGAR
CHECKED BY: M.LORENGER
DATE: 12.3.2013

STANDARD FORM SF-2
TIME OF CONCENTRATION SUMMARY
(RATIONAL METHOD PROCEDURE)

JOB NO: 13.0595
PROJECT: Camp George West

SUB-BASIN DATA				INITIAL/OVERLAND TIME (t_i)			TRAVEL TIME (t_t)					t_c CHECK (URBANIZED BASINS)			FINAL t_c	REMARKS
BASIN	DESIGN POINT	C_5	AREA	LENGTH	SLOPE	t_i	LENGTH	SLOPE	C_v	VEL.	t_t	COMP.	TOT. LENGTH	tc=(L/180)+10		
			ac	ft	ft/ft	min	ft	ft/ft		fps	Min	t_c	ft	min	min	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	
EX-1	1	0.65	4.75	531	0.0243	14.0	724	0.0445	20	4.22	2.9	16.8	1254.9	17.0	16.8	
EX-2	2	0.80	16.75	773	0.0285	10.7	809	0.0346	20	3.72	3.6	14.3	1582.2	18.8	14.3	
EX-3	3	0.30	4.50			0.0	582	0.0269	20	3.28	3.0	3.0	582.0	13.2	5.0	
EX-4	4	0.65	24.00	583	0.0321	13.4	865	0.0284	20	3.37	4.3	17.6	1448.5	18.0	17.6	

*Velocity (V) = $C_v S_w 0.5$

TABLE RO-2

Type of Land Surface	Conveyance Coefficient, Cv
Heavy Meadow	2.5
Tillage / Field	5
Short Pasture and Lawns	7
Nearly Bare Ground	10
Grassed Waterway	15
Paved Areas and Shallow Paved Swales	20

Table RO-2, UDFCD (V.1), Chapter 5, Page RO-6

in which: Cv = Conveyance Coefficient (See Table Above)
Sw = Watercourse Slope (ft/ft)

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CALCULATED BY: K.ALLEGAR
CHECKED BY: M.LORENGER
DATE: 12.3.2013

STANDARD FORM SF-3
STORM DRAINAGE SYSTEM DESIGN
(RATIONAL METHOD PROCEDURE)

JOB NO: 13.0595
PROJECT: Camp George West
DESIGN STORM: 5-YEAR
ONE-HR PRECIP: 1.35

BASIN	DESIGN POINT	DIRECT RUNOFF						TOTAL RUNOFF				REMARKS
		AREA (AC)	RUNOFF COEFF	t_c (MIN)	CxA (AC)	I (IN/HR)	Q (CFS)	t_c (MIN)	S(CxA) (AC)	I (IN/HR)	Q (CFS)	
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)
EX-1	1	4.75	0.65	16.8	3.09	2.90	8.95	16.8	3.09	2.90	8.95	
EX-2	2	16.75	0.80	14.3	13.40	3.14	42.02	14.3	13.40	3.14	42.02	
EX-3	3	4.50	0.30	5.0	1.35	4.58	6.18	5.0	1.35	4.58	6.18	
EX-4	4	24.00	0.65	17.6	15.60	2.83	44.19	17.6	15.60	2.83	44.19	
										Total	**101.34**	

I. One-Hr Precipitation Values for the City and County of Denver

Return Period:	2-YEAR	5-YEAR	10-YEAR	100-YEAR
Depth In Inches:	0.95	1.35	1.61	2.61

Equation RA-3, UDFCD (V.1), Chapter 4, Page RA-6

*Rainfall Intensity: $I = \frac{(28.5 \times P1)}{(10 + t_c)^{0.786}}$

In Which:
I = Rainfall Intensity (Inches Per Hour)
P1 = 1-Hour Point Rainfall Depth (Inches)
tc = Time Of Concentration (Minutes)

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5-YEAR
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CALCULATED BY: K.ALLEGAR
CHECKED BY: M.LORENGER
DATE: 12.3.2013

STANDARD FORM SF-3
STORM DRAINAGE SYSTEM DESIGN
(RATIONAL METHOD PROCEDURE)

JOB NO: 13.0595
PROJECT: Camp George West
DESIGN STORM: 100-YEAR
ONE-HR PRECIP: 2.61

BASIN	DESIGN POINT	DIRECT RUNOFF						TOTAL RUNOFF				REMARKS
		AREA (AC)	RUNOFF COEFF	t_c (MIN)	CxA (AC)	I (IN/HR)	Q (CFS)	t_c (MIN)	S(CxA) (AC)	I (IN/HR)	Q (CFS)	
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)
EX-1	1	4.75	0.80	16.8	3.80	5.61	21.30	16.8	3.80	5.61	21.30	
EX-2	2	16.75	0.85	14.3	14.24	6.06	86.31	14.3	14.24	6.06	86.31	
EX-3	3	4.50	0.57	5.0	2.57	8.85	22.71	5.0	2.57	8.85	22.71	
EX-4	4	24.00	0.80	17.6	19.20	5.48	105.16	17.6	19.20	5.48	105.16	
										Total	**235.48**	

I. One-Hr Precipitation Values for the City and County of Denver

Return Period:	2-YEAR	5-YEAR	10-YEAR	100-YEAR
Depth In Inches:	0.95	1.35	1.61	2.61

**Equation RA-3, UDFCD (V.1), Chapter 4, Page RA-6*

*Rainfall Intensity:

$$I = \frac{(28.5 \times P1)}{(10 + t_c)^{0.786}}$$

In Which:
I = Rainfall Intensity (Inches Per Hour)
P1 = 1-Hour Point Rainfall Depth (Inches)
tc = Time Of Concentration (Minutes)

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100-YEAR
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PROJECT: Camp George West
JOB NO: 01/13/00
DATE: 12.3.2013

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RUNOFF SUMMARY

BASIN	DESIGN POINT	AREA (ACRES)	% IMP.	C_5	C_{100}	Q_5 (CFS)	Q_{100} (CFS)
EX-1	1	4.75	70.0%	0.65	0.80	8.95	21.30
EX-2	2	16.75	80.0%	0.80	0.85	42.02	86.31
EX-3	3	4.50	30.0%	0.30	0.57	6.18	22.71
EX-4	4	24.00	72.0%	0.65	0.80	44.19	105.16
SITE COMPOSITE		**50.00**	**70.7%**	**0.67**	**0.80**	**101.34**	**235.48**

RUNOFF_SUMMARY
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\\civil\Civil\SCHLAGETER\13.0535-State of Colorado Capitol Master Plan\ENG\DRAINAGE\Camp George West- Rational.xls

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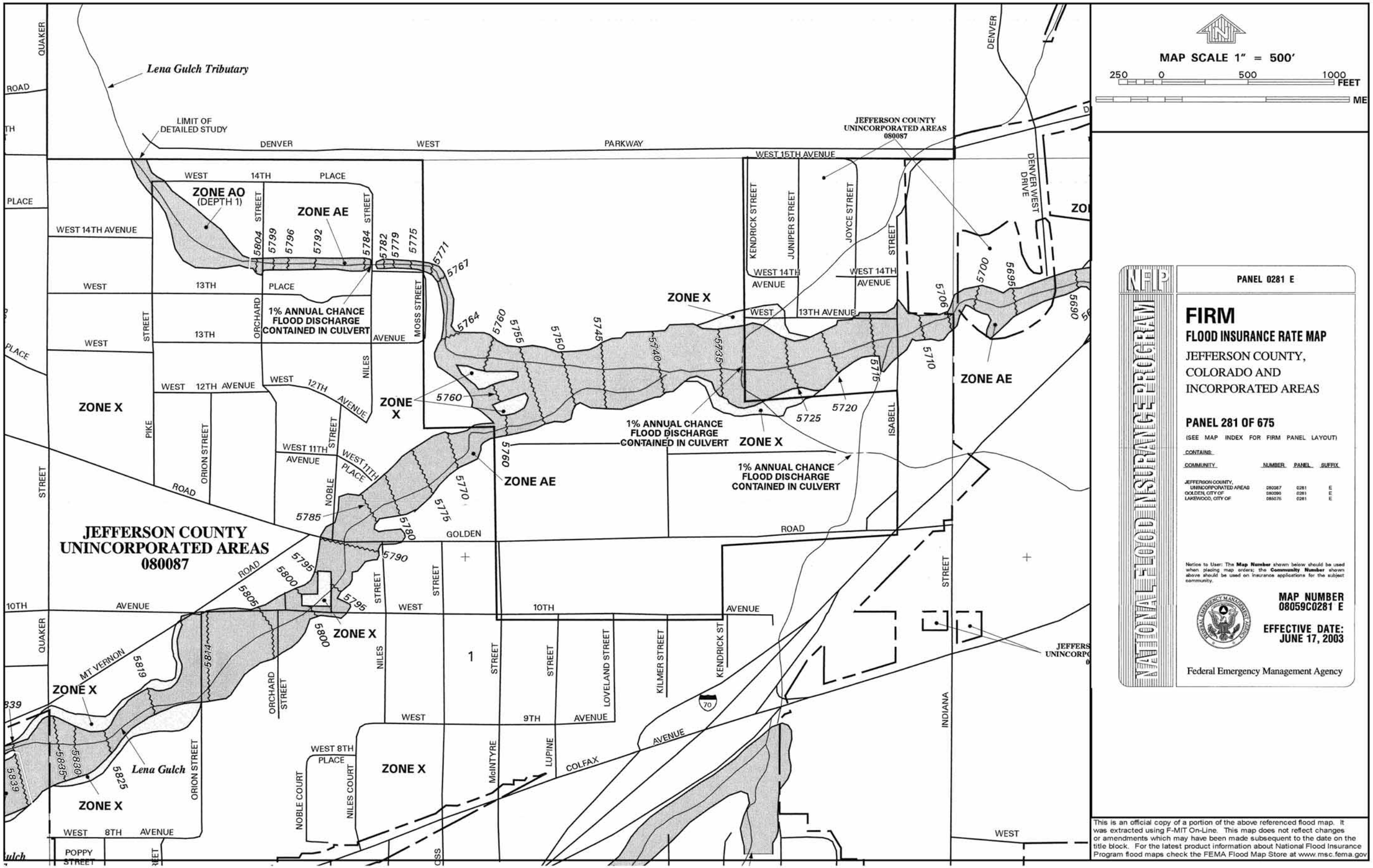
Lena Gulch Tributary
LIMIT OF DETAILED STUDY
DENVER WEST PARKWAY
WEST 15TH AVENUE
JEFFERSON COUNTY UNINCORPORATED AREAS 080087
ZONE AO (DEPTH 1)
ZONE AE
1% ANNUAL CHANCE FLOOD DISCHARGE CONTAINED IN CULVERT
ZONE X
ZONE AE
1% ANNUAL CHANCE FLOOD DISCHARGE CONTAINED IN CULVERT
ZONE X
1% ANNUAL CHANCE FLOOD DISCHARGE CONTAINED IN CULVERT
ZONE AE
ZONE X
ZONE X
ZONE X
ZONE X
JEFFERSON COUNTY UNINCORPORATED AREAS 080087
Lena Gulch
WEST 14TH PLACE
WEST 14TH AVENUE
WEST 13TH PLACE
WEST 13TH AVENUE
WEST 12TH AVENUE
WEST 11TH AVENUE
WEST 11TH PLACE
WEST 10TH AVENUE
WEST 9TH AVENUE
WEST 8TH PLACE
WEST 8TH AVENUE
POPPY STREET
QUAKER STREET
ORCHARD STREET
MOSS STREET
NILES STREET
PIKE STREET
ORION STREET
NOBLE STREET
NOBLE COURT
NILES COURT
MCINTYRE STREET
LUPINE STREET
LOVELAND STREET
KILMER STREET
KENDRICK STREET
JUNIPER STREET
JOYCE STREET
ISABELL STREET
INDIANA STREET
DENVER WEST DRIVE
GOLDEN ROAD
MT VERNON ROAD
COLFAX AVENUE
70
5804
5799
5796
5792
5784
5782
5779
5775
5771
5767
5764
5760
5755
5750
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5805
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5819
5839
5835
5830
5825

MAP SCALE 1" = 500'
250 0 500 1000 FEET
PANEL 0281 E
FIRM
FLOOD INSURANCE RATE MAP
JEFFERSON COUNTY, COLORADO AND INCORPORATED AREAS
PANEL 281 OF 675
(SEE MAP INDEX FOR FIRM PANEL LAYOUT)
CONTAINS:
COMMUNITY NUMBER PANEL SUFFIX
JEFFERSON COUNTY, UNINCORPORATED AREAS 080087 0281 E
GOLDEN, CITY OF 080090 0281 E
LAKEWOOD, CITY OF 085075 0281 E
Notice to User: The Map Number shown below should be used when placing map orders; the Community Number shown above should be used on insurance applications for the subject community.
MAP NUMBER 08059C0281 E
EFFECTIVE DATE: JUNE 17, 2003
Federal Emergency Management Agency
NATIONAL FLOOD INSURANCE PROGRAM
This is an official copy of a portion of the above referenced flood map. It was extracted using F-MIT On-Line. This map does not reflect changes or amendments which may have been made subsequent to the date on the title block. For the latest product information about National Flood Insurance Program flood maps check the FEMA Flood Map Store at www.msc.fema.gov

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WATER

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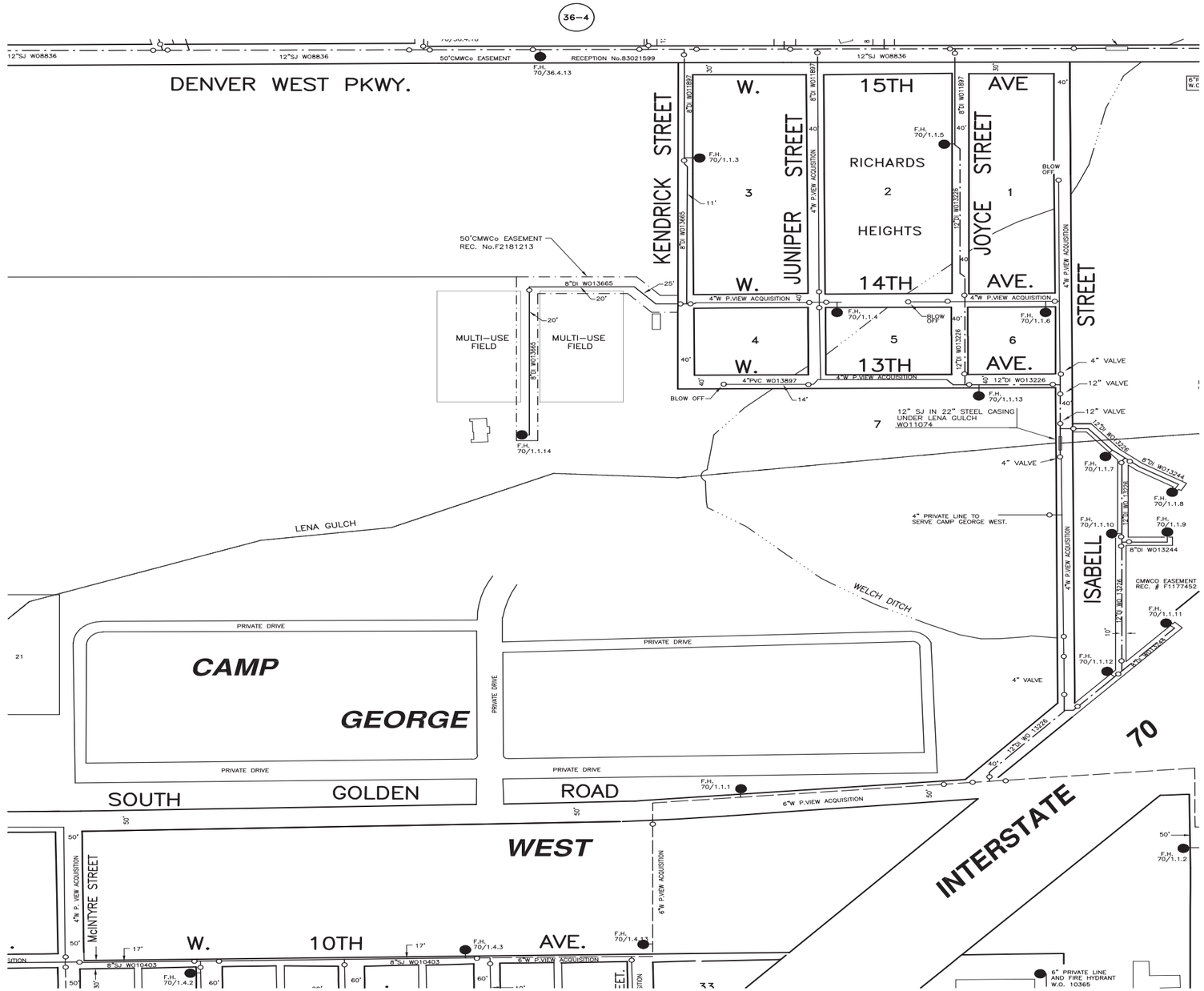
FIRE HYDRANT FLOW DATA

FOR INFORMATION ONLY – ALL FLOWS MUST BE FIELD VERIFIED

HYDRANT NUMBER	STATIC PRESSURE	RESIDUAL PRESSURE	FLOW GPM	@ 20PSI IN GPM	FLOW DATE
70/1.1.1	100 PSI	79 PSI	1561	3196	6/05
70/1.1.2	110 PSI	100 PSI	1757	5621	6/05
70/1.1.3	106 PSI	85 PSI	1620	3443	6/05
70/1.1.4	111 PSI	79 PSI	1561	2740	6/05
70/1.1.5	108 PSI	93 PSI	1694	4344	6/05
70/1.1.6	115 PSI	70 PSI	1470	2202	6/05
70/1.1.7	120 PSI	105 PSI	1800	4932	6/05
70/1.1.8	118 PSI	106 PSI	1809	5504	6/05
70/1.1.9	118 PSI	100 PSI	1757	4333	6/05
70/1.1.10	118 PSI	106 PSI	1809	5504	6/05
70/1.1.11	115 PSI	110 PSI	1842	8650	6/05
70/1.1.12	115 PSI	110 PSI	1842	8650	6/05
70/1.1.13	119 PSI	111 PSI	1851	6976	6/05
70/1.1.14	109 PSI	86 PSI	1629	3362	9/06



LEGEND

- VALVE
- FIRE HYDRANT

PIPE DESIGNATION

- U UNIVERSAL C.I.
- B C.I. BELL & SPIGOT
- SJ SLIP JOINT C.I.
- M MECHANICAL JOINT C.I.
- T TRANSITE

- 4" MAIN
- 6" MAIN
- 8" MAIN
- 10" MAIN
- 12" MAIN
- 14" MAIN
- 15" MAIN
- 16" MAIN
- 18" MAIN
- 20" PLUS

INFORMATION PROVIDED ON THIS MAP IS INTENDED TO BE AN OVERVIEW OF SYSTEM FACILITIES AND IS NOT TO BE USED FOR DESIGN AND CONSTRUCTION PURPOSES. ACUTAL LOCATION OF ANY FACILITY MUST BE FIELD VERIFIED.

REVISED 4/11

THE CONSOLIDATED MUTUAL WATER COMPANY

NE1/4 SEC.1, T.4S., R.70W.

SCALE: NONE

DWG.NO. 1–4–70 NE

INDEX NO. 1–1

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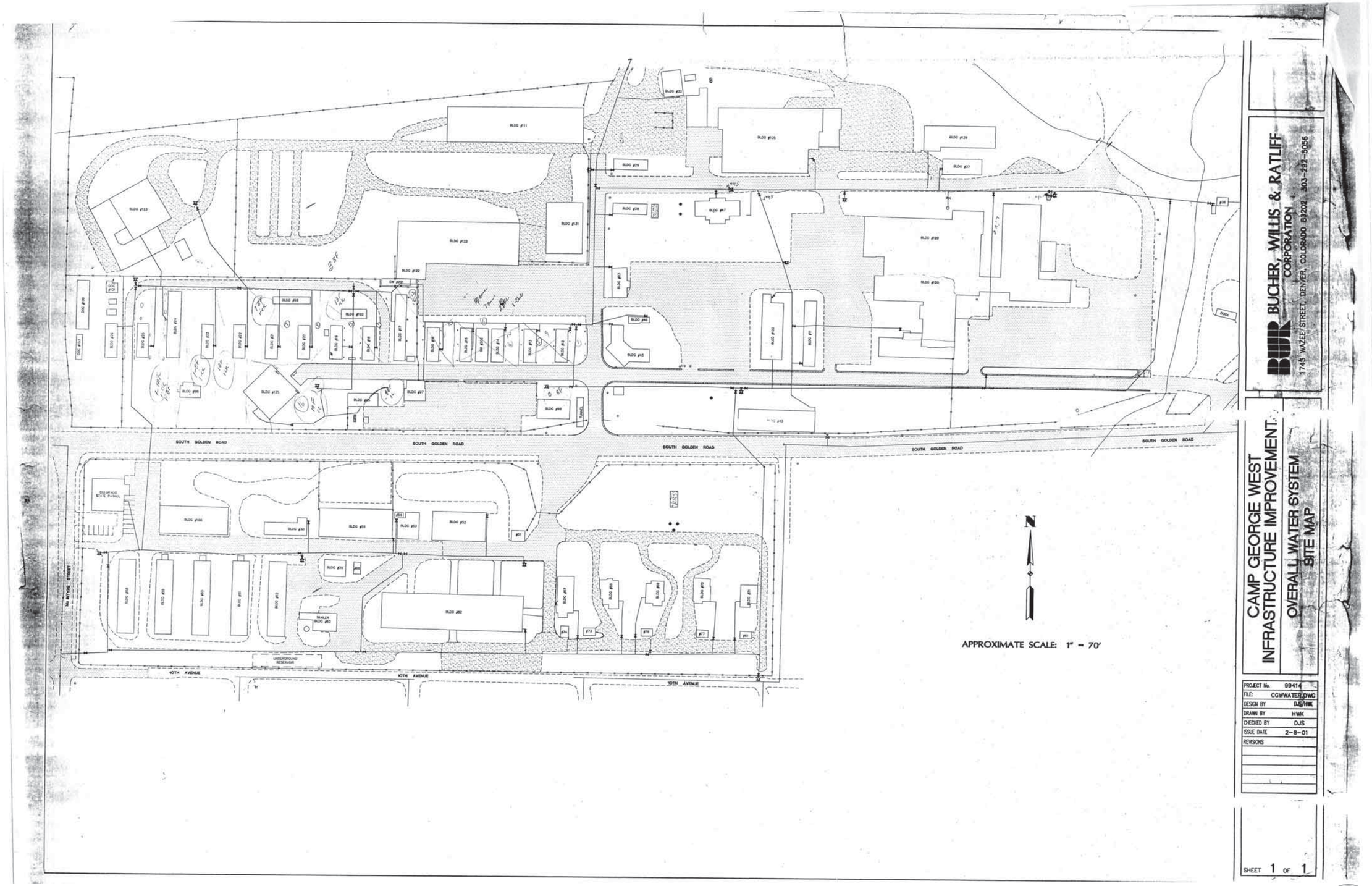
SOUTH GOLDEN ROAD
10TH AVENUE
COLORADO STATE PATROL
UNDERGROUND RESERVOIR
N
APPROXIMATE SCALE: 1" = 70'
BUCHER, WILLIS & RATLIFF CORPORATION
1745 WAZEE STREET, DENVER, COLORADO 80202 303-293-5056
CAMP GEORGE WEST
INFRASTRUCTURE IMPROVEMENT
OVERALL WATER SYSTEM
SITE MAP
PROJECT No. 99414
FILE: CGWWATER.DWG
DESIGN BY DJS/HWK
DRAWN BY HWK
CHECKED BY DJS
ISSUE DATE 2-8-01
REVISIONS
SHEET 1 OF 1

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SANITARY SEWER

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