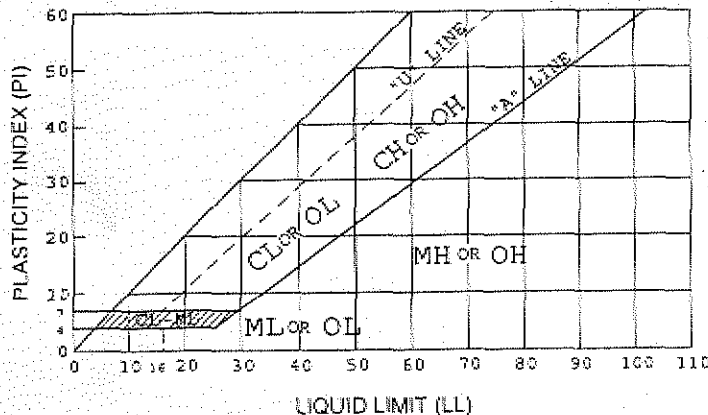


SOIL CLASSIFICATION CHART

MAJOR DIVISIONS			SYMBOLS	TYPICAL DESCRIPTIONS
			GRAPH LETTER	
COARSE GRAINED SOILS	GRAVEL AND GRAVELLY SOILS	CLEAN GRAVELS (LITTLE OR NO FINES)	GW	WELL-GRADED GRAVELS, GRAVEL-SAND MIXTURES, LITTLE OR NO FINES
		GRAVELS WITH FINES (APPRECIABLE AMOUNT OF FINES)	GP	POORLY-GRADED GRAVELS, GRAVEL-SAND MIXTURES, LITTLE OR NO FINES
			GM	SILTY GRAVELS, GRAVEL-SAND-SILT MIXTURES
	SAND AND SANDY SOILS	CLEAN SANDS (LITTLE OR NO FINES)	SW	WELL-GRADED SANDS, GRAVELLY SANDS, LITTLE OR NO FINES
		SANDS WITH FINES (APPRECIABLE AMOUNT OF FINES)	SP	POORLY-GRADED SANDS, GRAVELLY SANDS, LITTLE OR NO FINES
			SM	SILTY SANDS, SAND-SILT MIXTURES
FINE GRAINED SOILS	SILTS AND CLAYS	LIQUID LIMIT LESS THAN 50	ML	INORGANIC SILTS AND VERY FINE SANDS, ROCK FLOUR, SILTY OR CLAYEY FINE SANDS OR CLAYEY SILTS WITH SLIGHT PLASTICITY
			CL	INORGANIC CLAYS OF LOW TO MEDIUM PLASTICITY, GRAVELLY CLAYS, SILTY CLAYS, LEAN CLAYS
			OL	ORGANIC SILTS AND ORGANIC SILTY CLAYS OF LOW PLASTICITY
	SILTS AND CLAYS	LIQUID LIMIT GREATER THAN 50	MH	INORGANIC SILTS, MICACEOUS OR SCAPOLOUS FINE SAND OR SILTY SOILS
			CH	INORGANIC CLAYS OF HIGH PLASTICITY
			OH	ORGANIC CLAYS OF MEDIUM TO HIGH PLASTICITY, ORGANIC SILTS
HIGHLY ORGANIC SOILS			PT	PEAT, HUMUS, SWAMP SOILS WITH HIGH ORGANIC CONTENTS
FILL MATERIAL			--	FILL MATERIAL, NON-NATIVE

NOTE: DUAL SYMBOLS ARE USED TO INDICATE BORDERLINE SOIL CLASSIFICATIONS.

PLASTICITY CHART



FOR CLASSIFICATION OF FINE-GRAINED SOILS AND FINE-GRAINED FRACTION OF COARSE-GRAINED SOILS

EXPLORATION SAMPLE TERMINOLOGY

Sample Type	Sample Symbol	Sample Code
Auger Cuttings		Auger
Bulk (Grab) Sample		Grab
Modified California Sampler		MC
Shelby Tube		SH or ST
Standard Penetration Test		SPT
Split Spoon		SS
No Sample		

GRAIN SIZE TERMINOLOGY

Component of Sample	Size Range
Boulders	Over 12 in. (300mm)
Cobbles	12 in. to 3 in. (300mm to 75mm)
Gravel	3 in. to #4 sieve (75mm to 2mm)
Sand	#4 to #200 sieve (2mm to 0.074mm)
Silt or Clay	Passing #200 sieve (0.074mm)

RELATIVE DENSITY OF GRANULAR SOILS

N - Blows/ft	Relative Density
0 - 4	Very Loose
5 - 10	Loose
11 - 30	Medium Dense
31 - 50	Dense
greater than 50	Very Dense

CONSISTENCY OF COHESIVE SOILS

Unconfined Compressive Strength, psf	N - Blows/ft	Consistency
less than 500	0 - 1	Very Soft
500 - 1,000	2 - 4	Soft
1,000 - 2,000	5 - 8	Firm
2,000 - 4,000	9 - 15	Stiff
4,000 - 8,000	16 - 30	Very Stiff
8,000 - 15,000	31 - 60	Hard
greater than 15,000	greater than 60	Very Hard

USCS CHART 0383131.GPJ US LAB.GDT 10/13/2005



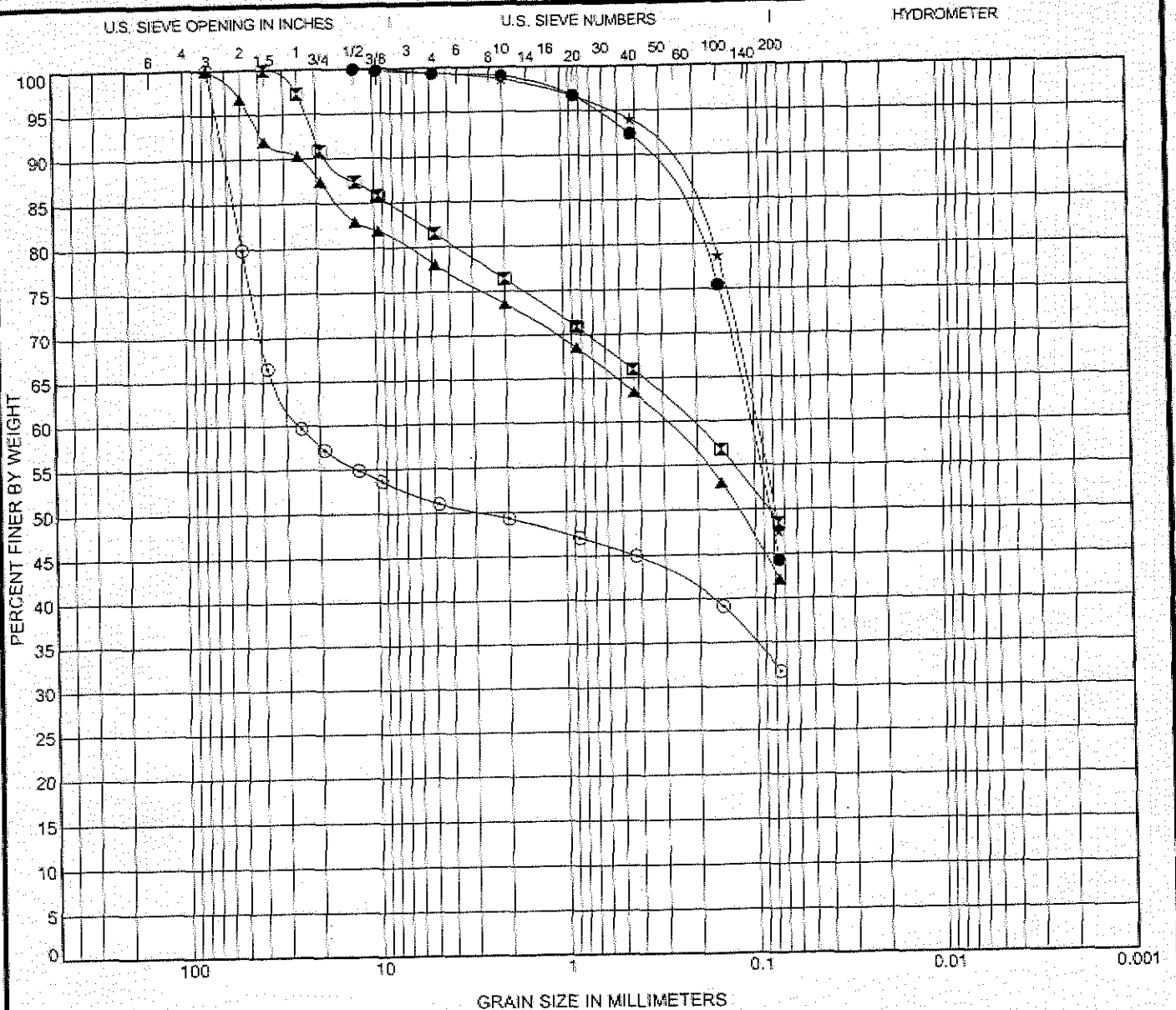
Black Eagle Consulting, Inc.
1345 Capital Blvd., Suite A
Reno, Nevada 89502-7140
Telephone: (775) 359-6600
Fax: (775) 359-7766

USCS Soil Classification Chart

Project: Summerhawk

Location: Carson City, Nevada

Project Number: 0383-13-1 Plate Number: 3



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

Specimen Identification	USCS Classification	LL	PL	PI	Cc	Cu
● TP-01 1.0'	SILTY SAND (SM)	NP	NP	NP		
□ TP-09 1.0'	CLAYEY SAND with GRAVEL (SC)	29	14	15		
▲ TP-10 1.5'	CLAYEY SAND with GRAVEL (SC)	29	15	14		
★ TP-11 1.0'	SILTY SAND (SM)	NP	NP	NP		
○ TP-14 4.0'	CLAYEY GRAVEL with SAND (GC)	36	17	19		

Specimen Identification	D100	D60	D30	D10	MC %	%Gravel	%Sand	%Silt	%Clay
● TP-01 1.0'	12.5	0.106			10.8	0.6	55.1	44.3	
□ TP-09 1.0'	37.5	0.216			7.4	18.5	33.1	48.5	
▲ TP-10 1.5'	75	0.302			9.8	21.9	35.9	42.1	
★ TP-11 1.0'	9.5	0.099			6.4	0.6	51.9	47.5	
○ TP-14 4.0'	75	25.456			7.9	48.9	19.4	31.7	

GRAIN SIZE DISTRIBUTION

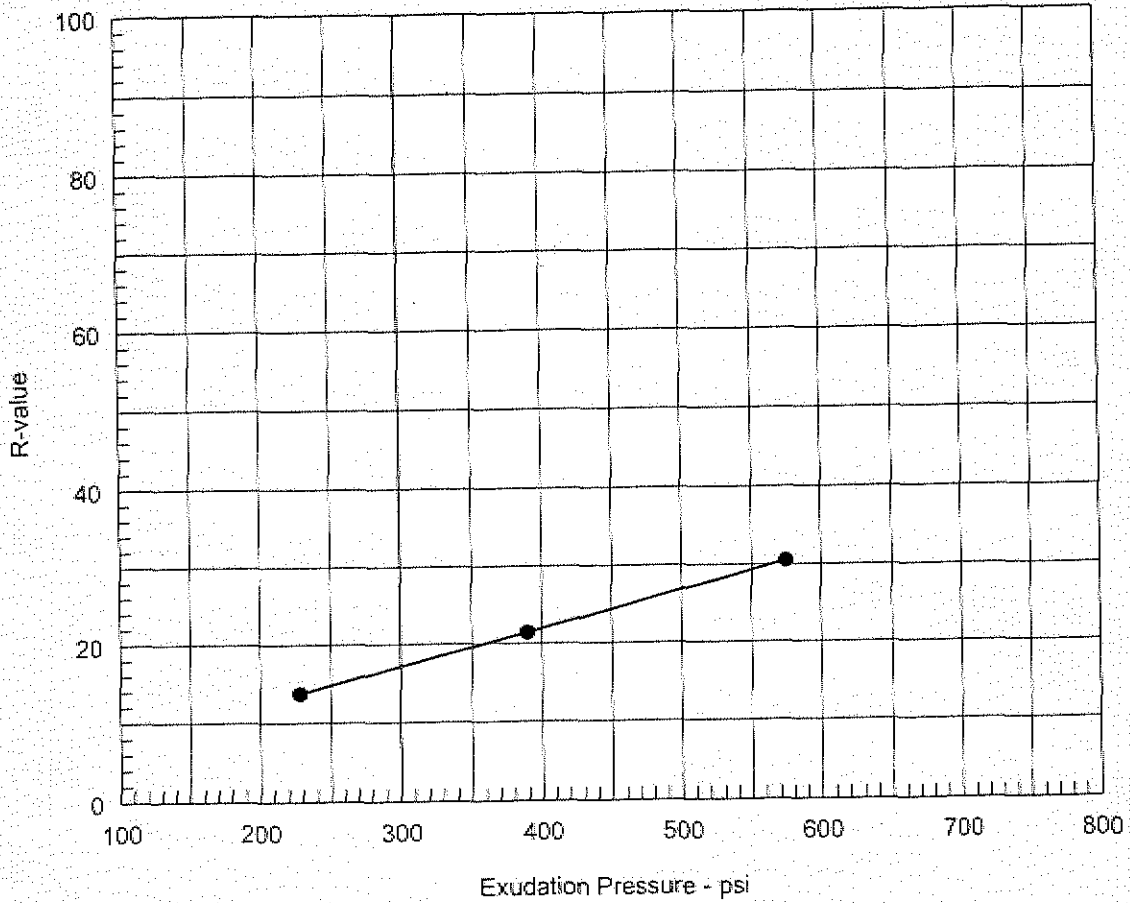
Black Eagle Consulting, Inc.
 1345 Capital Blvd., Suite A
 Reno, Nevada 89502-7140
 Telephone: (775) 359-6600
 Fax: (775) 359-7766

Project: Summerhawk
 Location: Carson City, Nevada
 Project Number: 0383-13-1 Plate Number: 4a

U.S. GRAIN SIZE 0303131.GPJ U.S. LAB GDT 9/22/2006



R-VALUE TEST REPORT

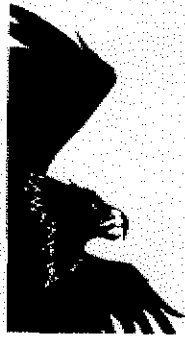


Resistance R-Value and Expansion Pressure - ASTM D 2844

No.	Compact Pressure psi	Density pcf	Moist. %	Expansion Pressure psi	Horizontal Press. psi @ 160 psi	Sample Height in.	Exud. Pressure psi	R Value	R Value Corr.
1	200	121.2	13.5	0.39	109	2.41	390	23	21
2	140	116.1	15.8	0.21	124	2.46	228	14	14
3	290	123.7	12.5	1.18	98	2.45	575	30	30

Test Results	Material Description
R-value at 300 psi exudation pressure = 17	Clayey Sand with Gravel
Project No.: 0383-13-1 Project: Summerhawk Source of Sample: TP-10 Depth: 1.5' - 7.0' Sample Number: A Date: 10/12/2006	Tested by: M. Theissen Checked by: G. Bomberger Remarks: Laboratory Number 7786
R-VALUE TEST REPORT BLACK EAGLE CONSULTING, INC.	

Grading Plan



Black Eagle Consulting, Inc. 1345 Capital Boulevard, Suite A
Geotechnical & Construction Services Reno, Nevada 89502-7140

Telephone: 775/359-6600
Facsimile: 775/359-7766

Email: mail@blackeagleconsulting.com

Ms. Michelle Godde
Syncon Homes
990 Ironwood Drive
Minden, Nevada 89423

September 13, 2006
Project No.: 0383-13-1

**RE: Mass Grading Recommendations
Summer Hawk Subdivision
Carson City, Nevada**

Dear Ms. Godde:

Black Eagle Consulting, Inc. advances the following geotechnical recommendations to support the design and construction of mass grading for the proposed Summer Hawk subdivision.

PROJECT DESCRIPTION

The site consists of an irregular hilly parcel of approximately 554 acres located in Carson City, Nevada. The proposed subdivision is entirely contained in Section 19, Township 15 North, Range 20 East, and Section 24, Township 15 North, Range 19 East M.D.M. The parcel lies in two valleys bordered on the north by "C" Hill, to the south and west by unnamed ridges, and to the east by the Rhodes and Betts Street area of Carson City. The area to the east of the subdivision is broken into numerous rectangular parcels, including private residences, storage yards, and a plant nursery. The site is reached by a network of unimproved roads which extend from the west end of Rhodes Street.

Structure/Development Information

The proposed development will consist of a 179-lot residential subdivision, along with associated paved streets and underground utilities. Cuts of up to 35 feet will be involved in grading the site. Nearly all houses will be split-level with walk-in basements to accommodate the site topography. Ten- to fifteen-foot-high retaining walls are shown on the plans in a number of areas for the uphill (cut) edges of roadways and for cuts at the back of house lots.

Services will be provided by connection to municipal utilities at the east edge of the project. Roads and utilities will be dedicated to Carson City upon completion of the project.

Grading Concepts

Grading concepts were evaluated from an undated, preliminary site grading plan by Capital Engineering. Proposed grading in residential areas will consist of fills to about 10 feet thick and cuts to as high as 35 feet. Fills of up to 20 feet will be required where the roads cross the ravine through the site. Cut slopes

Ms. Michelle Godde
Syncon Homes
September 13, 2006
Page 2

30 to 40 feet high at 2H:1V (Horizontal:Vertical) are proposed in backyards between houses, and cut slopes of up to 50 feet are proposed at the uphill edges of the project.

Houses will be built where existing slope is shallow, at less than about 15 percent gradient. The development generally will follow an existing drainage extending uphill from Carson City. The drainage will be maintained unmodified in the eastern half of the project, with roads and houses on one or both sides of the ravine. The adjacent upland areas above the ravine are generally 10 percent slope or less; cuts of up to 15 feet will be common, but the uphill cuts near the upper edges of the development will be as high as 30 to 35 feet. In the western half of the project, the surface drainage will be diverted or buried, and houses will be developed across the relatively-level valley bottom.

SITE CONDITIONS

The site follows the northern of two ravines which drain easterly from the hills on the east edge of Carson City near the west ends of Rhodes and Betts Streets. The ravines vary from 4 to 8 percent gradient; the lower portions are incised into adjacent deposits with 2H:1V side slopes for 20 to 30 feet above the stream, before the slope shallows out into the gently-sloped uplands. The topography of the upland areas varies in slope from about 10 percent to in excess of 30 percent. The south access road enters the site at the mouth of the south ravine, the north access road follows the north ravine from its base. The base or east edge of the site is a steep (2H:1V) 40- to 50-foot-high scarp developed by a northern branch of the Genoa fault. The preliminary plan shows no houses or other structures proposed closer than 100 feet to the location of the fault scarp.

The project site is crossed by numerous dirt roads, and several old mines or prospects are shown on topographic maps. The largest mine or prospect is a pit and associated adit located near the ravine through the center of the project, and 750 feet from the east edge of the project. The preliminary site map shows two house lots being built over the pit location, where there will be a depth of cut for the proposed lots of 27 feet below ground surface. An impromptu shooting range is present in the valley at the east end of the project.

The entire site was burned in the summer of 2005. Site vegetation is limited to cheat grass and other grasses.

MASS GRADING RECOMMENDATIONS

Black Eagle Consulting, Inc. has performed preliminary exploration for the project site using a track excavator. In general we encountered volcanic and metavolcanic bedrock, in various conditions from

Ms. Michelle Godde
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Page 3

fresh to highly-weathered, and overlain by 1 to 5 feet of granular soil. Thicker zones of granular soil were found near the ravines and elsewhere, locally.

Our test pits have a maximum depth of about 15 feet; in a number of locations, this depth is considerably less than the planned depth of mass grading cuts. In three locations, in the area of deep uphill cuts, the excavator encountered refusal on competent and widely-fractured volcanic bedrock at 6 to 8 feet depth. Therefore, our mass grading recommendations are based on extrapolation of available shallow exploration data to greater depth. For preliminary planning purposes, in any of these areas where exploration is shallower than the proposed cuts, hard ripping with heavy equipment, or blasting, will likely be required to excavate to greater depth. We recommend additional phases of geotechnical exploration will be warranted.

All soil compaction requirements presented in this report are relative to ASTM D 1557.

Site Preparation

All vegetation should be stripped and grubbed from structural areas and removed from the site. A stripping depth of 0.2 to 0.5 feet is anticipated. Thin surface clays are present under the site, which should be removed as part of stripping of vegetation, or as part of keying of fills into native ground. All surfaces to receive structural fill or structural loading should be densified to, at least, 90 percent relative compaction.

The mine adit or pit in the eastern half of the site should be researched and fully investigated to determine safety for mass grading operations. If there is a tunnel or descending adit, a structural concrete slab or plug should be constructed at the bedrock surface to seal the tunnel and prevent movement of overlying structures.

During wet weather, soils may be well above optimum moisture and impossible to compact. In most situations, moisture conditioning may be possible by scarifying the top 12 inches of subgrade and allowing it to air dry to near-optimum moisture, prior to compaction. Where this procedure is ineffective or where construction schedules prohibit delays, the wet soils can probably be removed down to bedrock and replaced with dry structural fill. Where this is not practical, mechanical stabilization will be necessary. Mechanical stabilization may be achieved by over-excavation and/or placement of either an initial 12- to 18-inch-thick lift of 12-inch-minus, 3-inch-plus, well-graded, angular rock fill, or coarse gravel/cobble soils from eastern alluvial fan sources. The more angular and well graded the rock is, the more effective it will be. This fill should be densified with large equipment, such as a self-propelled sheeps-foot or a large loader, until no further deflection is noted. Additional lifts of rock may be necessary to achieve adequate stability. The use of a geotextile will prevent mud from pumping up between the rocks, thereby increasing rock-to-rock contact and decreasing the required thickness of stabilizing fill. The geotextile should meet or exceed the following minimum properties.

Trapezoid Strength (ASTM D 4533)	80 lbs.
Puncture Strength (ASTM D 4833)	120 lbs.
Grab Tensile/Elongation (ASTM D 4632)	245 @ 50 %

As an alternate to rock fill, a geotextile/gravel system may be used for stabilization. Aggregate base, Class C or D drain rock, or pit run gravels should be placed above the geotextile. Regardless of which alternate is selected, a test section is recommended to determine the required thickness of stabilization.

Grading and Filling

A considerable portion of the site will involve cuts in excess of 15 feet, the maximum depth of exploration. Due to an irregular bedrock typical of mountainous areas, it is likely that a portion of these areas will encounter hard bedrock at or below 15 feet depth which will require ripping with heavy equipment (such as a CAT D10 or larger) or may require blasting. While our logs often indicate that materials in the bottom of the test pit could likely be ripped, much harder materials may be present just below our depth of exploration. In three uphill areas, along proposed Eagle View Drive and Dove Tail Court, refusal was encountered on bedrock at 6 to 8 feet depth where cuts of 20 to 35 feet are proposed. Areas of hard bedrock should be noted during mass grading, as they will pose additional difficulties for installation of utility trenches. Use of a hoe-ram, "head-ache ball," rock saw, or line blasting will likely be necessary for utility trenching. Placement of deeper utilities in the fill side (or shallower cut side) of the street, as often as possible, will decrease trenching costs. Additional exploration, including air-track drilling and/or seismic surveys, may be warranted to assess rippability since the difference between blasting and ripping of deep excavations will greatly affect the costs of this development. *Blasting patterns may need to be tightened in order to generate fill with a usable range of particle sizes.*

Site soils, including excavated bedrock, will result in primarily granular material that will be suitable for use as structural fill. Considerable oversize rock should be expected from bedrock excavations. Oversized rock can be stockpiled for later use as erosion protection or placed in the bottom of deep non-structural fills. *In deep fills, oversized rocks must be scattered in such a manner as to preclude development of voids between the particles (nesting).*

Imported structural fill, if required, should meet the specifications of Table 2. These recommendations are intended as guidelines to specify a readily available, prequalified material. *Adjustments to the recommended limits can be provided to allow the use of other granular, non-expansive material.* Any such adjustments must be made and approved by the geological engineer, in writing, prior to importing fill to the site.

Sieve Size	Percent by Weight Passing	
8 Inch	100	
3/4 Inch	30 – 100	
No. 40	10 – 70	
No. 200	5 – 30	
Percent Passing No. 200 Sieve	Maximum Liquid Limit	Maximum Plastic Index
5 – 10	50	20
11 – 20	40	15
21 – 30	35	10

All fill placed on hillsides steeper than 5H:1V should be keyed into existing materials in equipment wide benches. Maximum vertical separation between benches should be 8 feet.

Whenever possible, structure foundations should not be placed partially on bedrock and partially on structural fill. Where structure foundations will be placed partially on bedrock and partially on structural fill due to cut and fill operations, differential settlement of the structural fill may be on the order of 1 percent of the maximum fill height, which would result in differential settlement of structure foundations. Such differential settlement should be minimized. Measures to minimize such differential settlement may include providing a gradual transition from the bedrock to structural fill and/or over-excavating a portion of the bedrock and backfilling with structural fill.

All soil structural fill and utility trench backfill in all structural areas should be densified to a minimum 90 percent relative compaction. Non-structural fill should be densified to, at least, 85 percent relative compaction to minimize consolidation and erosion. This is particularly important for yard areas since soil consolidation can cause water to pond in the drainage swales. Loose yard fill also allows water to infiltrate the backfill rather than flowing to the swale.

When the native granular soils have greater than 30 percent retained on the 3/4-inch sieve, standard density testing is not valid. A proof rolling program of at least five single passes of a minimum 10-ton roller in mass grading or at least five complete passes with hand compactors in footing trenches is recommended. Acceptance of this rock fill is based upon observation of maximum particle size (12-inch maximum), lift thickness (12-inch maximum), moisture content, and applied compactive effort. If a CAT 825 or larger sheeps-foot roller is used for compaction, both maximum particle size and maximum lift thickness can be increased to 18 inches. The use of larger rock sizes will hinder the fine-grading and utility trench excavation so that the cost-balance of using larger rocks should be given consideration. In all cases, the finished surface should be smooth, firm, and show no signs of deflection. Grading should not be performed with or on frozen soils.

Subsidence and Shrinkage

Subsidence of granular soils and bedrock exposed in cut should be negligible from construction traffic. Granular soils excavated and recompactd in structural fills should experience quantity shrinkage of 10 to 20 percent, including removal of oversize particles. In other words, one cubic yard of excavated granular soil will generate about 0.80 and 0.90 cubic yards of structural fill at 90 percent relative compaction. The excavated hard bedrock will generally result in quantity swell up to 30 percent. However the percentage of oversize material from the deeper cuts is not known and probably highly variable across the site. For this reason quantity shrink/swell is impossible to predict and might best be assumed to be a balance.

Foundation and Structure Design

Soils and bedrock are suitable for construction of the proposed houses on shallow spread footings. Retaining walls will have to be designed on a case-by-case basis, but we would expect that conventional concrete cantilever walls, soldier-pile-with-lagging walls, or soil nail walls would be appropriate given that most of the proposed walls are in areas of cut.

Rockery walls no higher than 8 feet could be used to retain cut soils, or 6-foot-high wall to support compacted fill slopes; no improvements should be built on top of rockery wall backfill. Tiered rockery walls can be built with an average slope of about 1.25H:1V.

Slope Stability and Erosion Control

Stability of cut and filled surfaces involves two separate aspects. The first concerns true slope stability related to mass wasting, landslides or the en masse downward movement of soil or rock. Stability of cut and fill slopes is dependent upon shear strength, unit weight, moisture content, and slope angle. The exploration and testing program conducted during this investigation confirms 2H:1V cut or fill soil slopes will be stable. Bedrock cuts can be as steep as 1H:1V; however, the bedrock surface, degree and orientation of fracturing, and weathering is often highly variable in depth, resulting in areas which will not be stable at steeper than 1.5H:1V. If bedrock cuts are steeper than 1.5H:1V, there is a risk that conditions will be determined to be unstable locally, and slopes will have to be laid back and/or shored after initial excavation. Soil mantle slopes above the bedrock surface should be laid back at 2H:1V.

The second aspect of stability involves erosion potential and is dependent on numerous factors involving grain size distribution, cohesion, moisture content, slope angle, and the velocity of the water or wind on the ground surface. Slopes between 2H:1V and 5H:1V can be stabilized by hydroseeding. Temporary irrigation may be necessary for slopes steeper than 3H:1V and turf reinforcement mats may be required to improve performance on 2H:1V slopes. Slopes steeper than 2H:1V to about 1.5H:1V require mechanical stabilization. Protection could be provided by a variety of methods such as rip-rap or geo-cell systems; however, vegetative stabilization with turf reinforcement mats and temporary irrigation would likely be the most cost effective and attractive. The Nevada Department of Transportation (NDOT) has recently

adopted for freeway projects a rip-rap slope with topsoil dropped into the rock voids, which has revegetated well and is attractive on slopes to 1.5H:1V. Bedrock slopes are potentially resistant to erosion at steeper than 1.5H:1V; however, as noted above, localized pockets in rock slope areas will have a deeper soil mantle, highly-fractured, or highly-weathered rock may require stabilization from an erosion-control aspect.

Slopes greater than about 2H:1V would likely require careful approval or consideration by the appropriate planning departments. Steepened slopes greater than 1.5H:1V also likely present a life-safety risk. A wire safety fence and brow ditch would likely be required at the top of such slopes. Rock falls (rolling boulders) would also present a risk to downhill structures and people.

All slopes higher than 5 feet (vertical) or with potential for drainage from above, will require a brow ditch to intercept runoff and direct it away from the slope face.

Dust potential at this site will be moderate during dry periods. Temporary (during construction) and permanent (after construction) erosion control will be required for all disturbed areas. The contractor shall prevent dust from being generated during construction in compliance with all applicable city, county, state, and federal regulations. The contractor shall submit an acceptable dust control plan to Carson City prior to starting site preparation or earthwork. Project specifications should include an indemnification by the contractor of the owner and engineer for any dust generation during the construction period. The owner will be responsible for mitigation of dust after accepting the project.

In order to minimize erosion and downstream impacts to sedimentation from this site, best management practices with respect to storm water discharge should be implemented at this site.

STANDARD LIMITATIONS CLAUSE

This report has been prepared in accordance with generally accepted geotechnical practices. The analyses and recommendations submitted are based on limited field explorations appropriate for preliminary design. This report does not reflect soils variations that may become evident during final design or the construction period, at which time re-evaluation of the recommendations may be necessary. We recommend our firm be retained to perform construction observation in all phases of the project related to geotechnical factors to ensure compliance with our recommendations. The owner shall be responsible for distributing this geotechnical investigation to all designers and contractors whose work is related to geotechnical factors.

Groundwater has not been encountered in our explorations to date. Fluctuations in the water table may occur due to rainfall, temperature, seasonal runoff or adjacent irrigation practices. Construction planning should be based on assumptions of possible variations in the water table.

Ms. Michelle Goddes
Syncon Homes
September 13, 2006
Page 8

This report has been produced to provide information allowing the architect or engineer to design the project. The owner is responsible for distributing this report to all designers and contractors whose work is affected by geotechnical aspects. In the event there are changes in the design, location, or ownership of the project from the time this report is issued, recommendations should be reviewed and possibly modified by the geotechnical engineer. If the geotechnical engineer is not granted the opportunity to make this recommended review, he or she can assume no responsibility for misinterpretation or misapplication of his or her recommendations or their validity in the event changes have been made in the original design concept without his or her prior review. The geotechnical engineer makes no other warranties, either expressed or implied, as to the professional advice provided under the terms of this agreement and included in this report.

Please feel free to contact us should you have any questions regarding this report.

Sincerely,

Black Eagle Consulting, Inc.

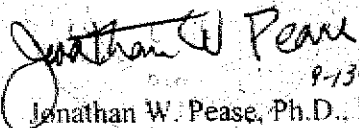
Dal Hunter, Ph.D., P.E.
Vice President

DHJWP/mk

Copies to: Addressee (5 copies)

Reference:

American Society for Testing and Materials (ASTM), 2003, *Soil and Rock; Dimension Stone; Geosynthetics*, Volume 4.08.

PLATE
12-2007

9-13-06
Jonathan W. Pease, Ph.D., P.E.
Project Engineer

Drainage Analysis

**Conceptual Drainage Study
for
Summerhawk Common Area Subdivision**

**Prepared for:
Syncon Homes
990 Ironwood Drive
Minden, Nevada 89423**

**Prepared by:
Capital Engineering
P.O. Box 3750
Carson City, Nevada 89702**

October, 2006

**Conceptual Drainage Study
For
Summerhawk Common Area Subdivision**

Introduction:

The Summerhawk Common Area Subdivision is a 201 lot residential development located in southwest Carson City, Nevada. The project is being developed by Syncon Homes and this study supports the Tentative Map for the proposed project.

The development is located near the current western terminus of Rhodes Street and the western terminus of Betts Street which are both accessed off of South Curry Street. The project is located in the foothills with the terrain sloping from west to east. The project site is currently undeveloped with significant slopes covered in field grasses that have grown subsequent to fires that have burned the site. The soils generally are rocky in nature with soil overburden that supports the grass growth.

The project acreage consists of 548 acres with development of the 201 lots occurring within 67 acres or 12% of the site. The remainder of the site will be dedicated to Carson City for Open Space, pathways, and parks.

From a drainage standpoint, the site consists of two main drainage-ways that flow from the high elevations to the west of the site and flow east through the site to two discharge points, one located near the western terminus of Betts Street and the other near the western terminus of Rhodes Street

Included herein is an aerial photo with the proposed project superimposed along with the site topography. This map provides a good overview of the site.

Existing and Proposed Hydrology:

The existing site hydrology consists of two main drainage basins that discharge at the eastern boundary of the site. See the enclosed map of the existing basins and the relationship to the project site. These basins are the source of two Federal Emergency Management (FEMA) non-detailed floodplains to the east of the site. FEMA hydrology for the two drainage basins was completed using TR-20 modeling in the late 1970's and early 1980's. The southerly basin (Betts) was identified as sub-basin 9 and the northerly basin (Rhodes) was identified as sub-basin 10. The actual calculation points for the hydrology for the two basins were at South Curry Street. The following is the data and results for the two basins as modeled by FEMA:

<u>Sub-basin</u>	<u>CN</u>	<u>A(Sq. Mi.)</u>	<u>L(hrs)</u>	<u>P100 (in)</u>	<u>Q100(cfs)</u>
9	80	0.63	0.62	4.60	352
10	80	0.88	0.69	4.60	503

In January of 2001, WRC Nevada completed revised hydrology for Carson City in connection with a Conditional Letter of Map Revision for the Carson City Freeway Phases 1A and 1B. The Summerhawk sub-basins were included in the revised hydrology presented in the WRC report. They were included due to the impact of these flows which ultimately cross the freeway alignment downstream near 5th Street. In the WRC study the two basins are included in one larger basin which provides calculations at Highway 395. The larger sub-basin in the WRC report was identified as sub-basin 4 and the following are the results from that study:

<u>Sub-basin</u>	<u>CN</u>	<u>A(Sq. Mi.)</u>	<u>L(hrs)</u>	<u>P100(in)</u>	<u>Q100(cfs)</u>
4	77	2.106	0.93	3.85	823

In September of 2004 after the Waterfall fire, Lumos and Associates provided a technical memorandum outlining 5-year flows for these two basins within an analysis that anticipated construction of drainage/sedimentation facilities at the outfall of these basins as well as basins collected by the drainage channel constructed along the base of "C" Hill. The Betts Street basin was identified as 4-B and the Rhodes basin was identified as 4-D within that study. The study looked at Curve Numbers of 81.5 for burned and 79 for Unburned conditions. The following are the results from the Lumos Memorandum:

<u>Sub-basin</u>	<u>CN</u>	<u>A(Sq. Mi.)</u>	<u>Q 5(cfs)</u>
4B Burned	81.5	0.592	53
4D Burned	81.5	0.862	77

Capital Engineering developed calculations for the project hydrology and utilized the above studies for correlation of the existing hydrology. Curve numbers were determined utilizing SCS mapping for soil types and native grass cover. The results confirmed the range of 77 to 81.5 (burned condition) provided in the previous studies and a curve number of 80 was accepted for the existing condition. The 77 utilized in the WRC analysis was likely a result of the additional area between Rhodes/Betts Streets and 395 contributing more permeable soils to the composite curve number within the larger basin area. Areas and lag times were then calculated and correlated with the existing studies and basin delineations. Rainfall was developed utilizing the more recent NOAA data provided from their website based on latitude and longitude of the sub-basin centroids. The sub-basin designations are 9 for the southerly Betts basin and 10 for the northerly Rhodes basin as related to FEMA's analysis. The following are the results of the existing condition discharges from the two Summerhawk sub-basins as calculated utilizing HEC-1 and the related input data:

<u>Sub-basin</u>	<u>CN</u>	<u>A(Sq. Mi.)</u>	<u>L(hrs)</u>	<u>P5</u>	<u>P100</u>	<u>Q5</u>	<u>Q100</u>
9	80	0.56	0.60	2.2	3.9	68	274
10	80	0.89	0.70	2.2	3.9	93	380

The results for the existing conditions discharges for the two basins are slightly higher than the Lumos results and lower than the FEMA results. The difference from the FEMA results can largely be explained by the difference in rainfall for the 100 year of 4.60 inches for the FEMA model and 3.9 inches from the current NOAA data. It should be noted that FEMA utilized 4.6 inches throughout the whole Carson City study and NOAA results recognize the variations based on relationship to the Sierras and elevations. NOAA tables and the HEC-1 analyses are provided in the Appendix of this report.

The proposed Summerhawk development will utilize underground storm drainage systems that will then convey runoff to the main existing drainage-ways and ultimately to the outlet points at the eastern boundary of the subdivision. Enclosed is a sub-basin map of the developed condition. The existing sub-basins 9 and 10 were further segregated to recognize the routing that will occur with the grading and drainage improvements for the site as outlined on the Tentative Map. A developed condition curve number of 87 was developed based on lot sizes and soil types. Lag times were developed for each sub-basin and routing coefficients were also developed to provide routing through the site. The HEC-1 results for the developed condition are provided in Table 1 and the comparison between the existing discharges and developed condition discharges for Rhodes and Betts Streets are provided in Table 2. These results do not include the impact of detention but show that the routing that occurs through the site and the small percentage of developed area relative to the basin sizes results in only a slight increase in peak discharges in the developed condition.

In the existing condition the discharges for the Rhodes Street and Betts Street basins discharges overland to the east running across mostly private property and within the existing Rhodes right of way. The non-detailed FEMA floodplain shows a conceptual impact of a 100-year runoff from the subject basins. The runoff ultimately flows to the State Railroad Museum at US 395 and through the linear park channel adjacent to Governor's Field.

Proposed Drainage Facilities

The proposed Summerhawk development's underground drainage systems will discharge to the existing channels within the two subject basins. The existing channels have been left undeveloped with the exception of road crossings, development of de-siltation/detention facilities along the drainages, and de-siltation/detention basins at the outlet points of the two drainages. Preliminary sizing of the de-siltation/detention basins have been provided and more detailed modeling of the facilities will occur with final design of the project. It is also anticipated that check-dams may be incorporated into the existing drainage channel for velocity and sedimentation control. The roadway crossings are required to be sized for the 25-year event but may require 100-year sizing due to the significant fills at the crossings. At the outlet of the two drainages, de-siltation/detention facilities will provide a method to collect the runoff and convey

flows via storm drain mains east to Curry Street and north to the Railroad Museum drainage way. This facility is part of a regional plan for drainage collection in the area and will significantly enhance runoff collection in this area of Carson City. It is also anticipated that large flows (100-year event) will flow overland along the Rhodes Street Right-of Way and ultimately to the US 395 drainage way. Reference the Tentative Map for preliminary facility design.

Conclusion:

The proposed Summerhawk development has been planned to accommodate not only on-site drainage collection but recognizes the impact of the off-site drainage. The facilities developed with the project will not only accommodate the existing project but will enhance the drainage collection for the area. All drainage development will comply with Carson City Municipal Code and the Carson City Development Standards and will provide safe mitigation measures to provide a safe and successful development.

Table 1

Developed Condition Summary (Without Detention)

Sub-Basin	5yr	25yr	100yr
9A	68	157	274
9B	56	119	196
BETTS ST.	76	166	282

Sub-Basin	5yr	25yr	100yr
10C	15	34	61
10D	7	16	29
COM1	20	48	85
10B	18	43	76
10A	44	103	183
10L	13	26	43
10I	11	25	44
COM2	79	183	323
10M	20	39	64
10E	12	28	49
10J	5	11	19
COM3	92	212	373
10N	6	11	19
10F	14	33	59
10G	2	5	9
COM4	15	35	62
10K	13	25	42
10P	8	15	25
COM5	101	229	400
10Q	4	8	14
10H	3	6	11
RHODES ST.	100	227	394

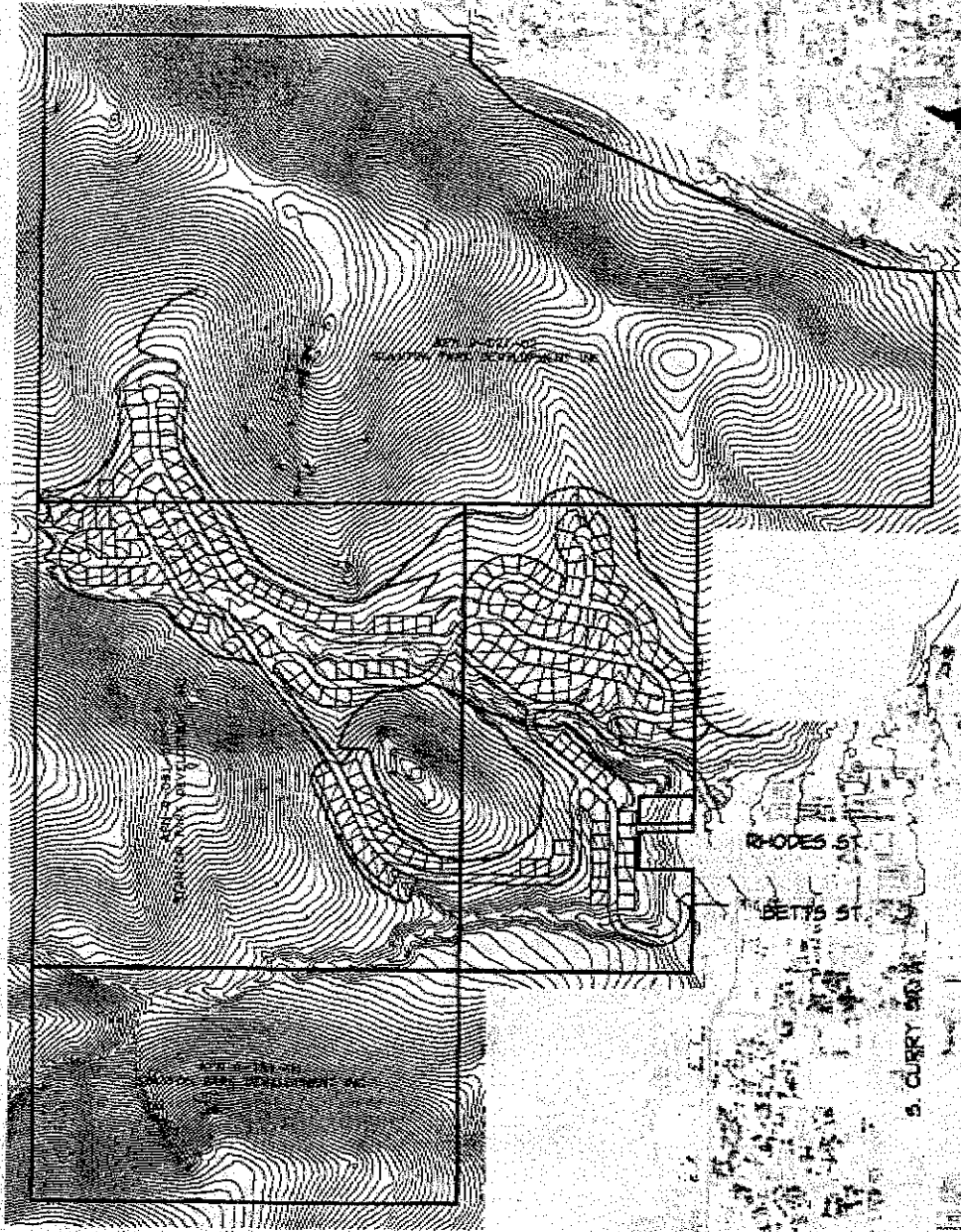
Table 2

Existing/Developed Condition (Without Detention)

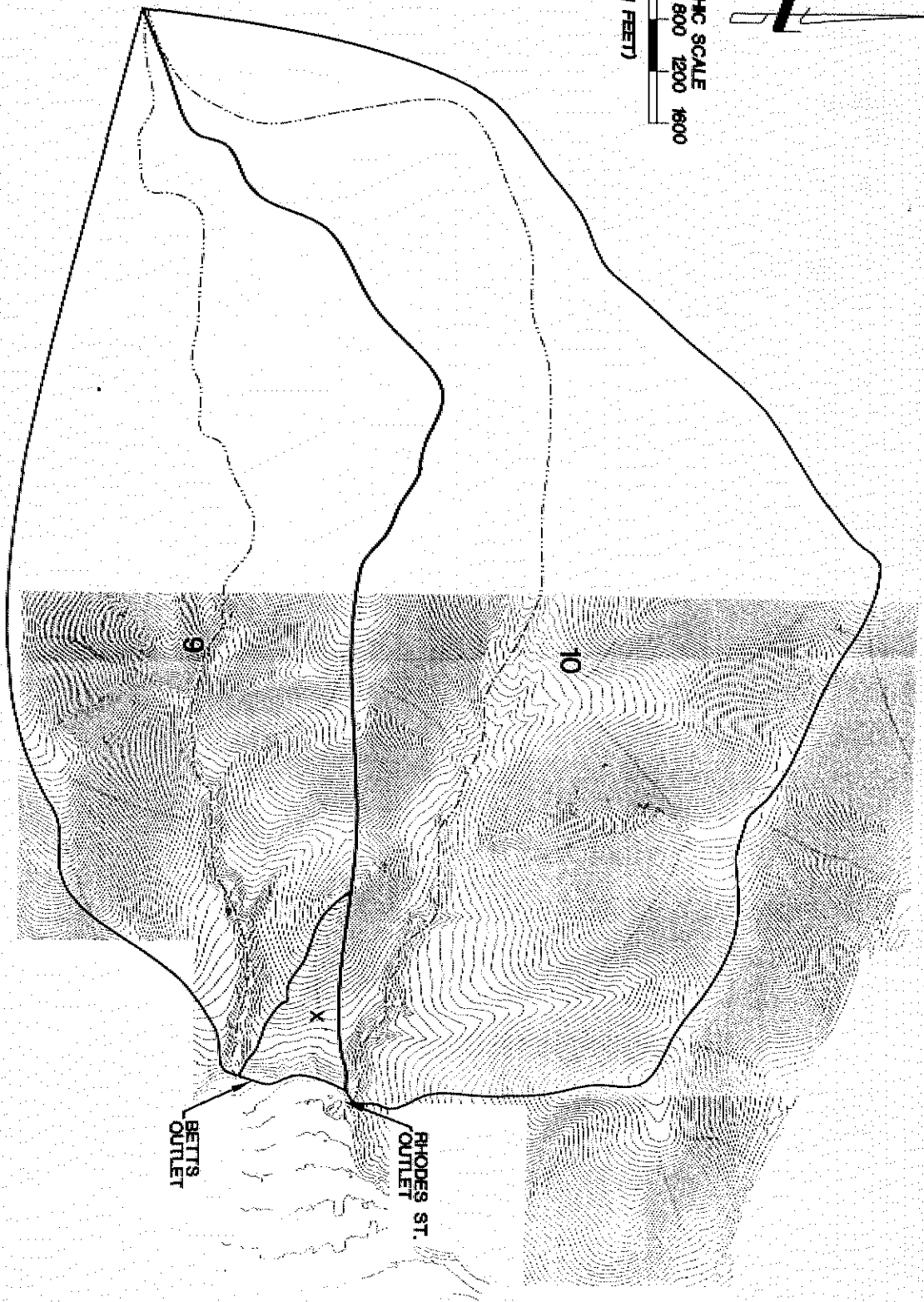
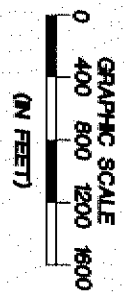
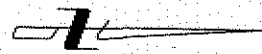
Betts St.		
	Pre	Post
5yr	68	76
25yr	157	166
100yr	274	282

Rhodes St.		
	Pre	Post
5yr	100	93
25yr	227	217
100yr	394	380

**PROPOSED
SUMMERHAWK
DEVELOPMENT**
OCT. 2006



U.S. MAY 395



1-1 DATE: OCT. 2004 DRAWN BY: JAC JOB NO.: 302 D-46 No. 261 Chances/Barndus	SYMCOX HONES 2221 Nevada Blvd. Suite A Minden, Nevada (775) 752-9761	SUMMER HAWK OPEN SPACE SUBDIVISION DRAINAGE BASIN EXISTING Carson City Nevada	CAPITAL ENGINEERING P.O. Box 8750 Carson City, NV 89702 (775) 882-5630	SHEET NO. 1-1 TOTAL SHEETS 1-1 DATE: OCT. 2004
				SCALE: 1" = 400' DRAWN BY: JAC CHECKED BY: JAC DATE: OCT. 2004

Appendix

EXISTING

```

*****
* FLOOD HYDROGRAPH PACKAGE (HEC-1) *
* JUN 1998 *
* VERSION 6.1 *
* RUN DATE 18OCT06 TIME 11:28:29 *
*****
    
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*****
* U.S. ARMY CORPS OF ENGINEERS *
* HYDROLOGIC ENGINEERING CENTER *
* 609 SECOND STREET *
* DAVIS, CALIFORNIA 95616 *
* (916) 756-1104 *
*****
    
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X X XXXXXXX XXXXX X
X X X X X XX
X X X X X X
XXXXXXXX XXXX X XXXXX X
X X X X X X
X X X X X X
X X XXXXXXX XXXXX XXX
    
```

THIS PROGRAM REPLACES ALL PREVIOUS VERSIONS OF HEC-1 KNOWN AS HEC1 (JAN 73), HEC1G, HEC1D, AND HEC1K.

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

1 HEC-1 INPUT PAGE 1

LINE	ID	1	2	3	4	5	6	7	8	9	10
1	ID										
2	ID										
3	ID										
4	ID										
5	ID										
6	ID										
7	ID										
8	ID										
9	ID										
10	ID										
11	JP	3									
12	IT	5									
13	IC	5									
	*DIAGRAM										
14	KK	BA9 BASIN 9									
15	KP	1									
16	BA	0.557									
17	PH		0.17	0.32	0.53	0.69	0.82	1.16	1.61	2.19	
18	LS	80									
19	UD	0.6									
20	KP	2									
21	PH		0.27	0.52	0.86	1.07	1.14	1.56	2.21	3.07	
22	KP	3									
23	PH		0.40	0.76	1.27	1.37	1.48	1.92	2.73	3.91	
24	KK	BA10 BASIN 10									
25	KP	1									
26	BA	.87									
27	PH		0.17	0.32	0.53	0.68	0.81	1.15	1.59	2.16	
28	LS	80									
29	UD	0.70									
30	KP	2									
31	PH		0.27	0.51	0.86	1.03	1.13	1.55	2.19	3.04	
32	KP	3									
33	PH		0.40	0.76	1.27	1.37	1.47	1.92	2.71	3.96	
34	KK	BA9 BASIN 9									
35	KP	1									
36	BA	.02									
37	PH		0.16	0.31	0.51	0.66	0.79	1.09	1.50	2.01	
38	LS	80									
39	UD	0.66									
40	KP	2									
41	PH		0.27	0.50	0.83	0.98	1.10	1.49	2.06	2.84	
42	KP	3									
43	PH		0.39	0.74	1.23	1.34	1.43	1.84	2.57	3.62	
44	ZZ										

SCHEMATIC DIAGRAM OF STREAM NETWORK

INPUT LINE (V) ROUTING (---) DIVERSION OR PUMP FLOW
 NO. (.) CONNECTOR (----) RETURN OF DIVERIED OR PUMPED FLOW

EXISTING

24

BA10

34

BAK

***** RUNOFF ALSO COMPUTED AT THIS LOCATION

```

*****
FLOOD HYDROGRAPH PACKAGE  (HEC-1)
      JUN 1998
      VERSION 4.1
RUN DATE 18OCT86 TIME 11:28:29
*****

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*****
U.S. ARMY CORPS OF ENGINEERS
HYDROLOGIC ENGINEERING CENTER
639 SECOND STREET
DAVIS, CALIFORNIA 95616
(916) 756-1104
*****

```

CARSON CITY
 SUMMERHAWK
 5, 25 and 100-year, 24-hour Event
 Pre-DEVELOPEMENT
 15-minute computation interval
 10-14-2006

PLAN 1 IS 5-YEAR
 PLAN 2 IS 25-YEAR
 PLAN 3 IS 100-YEAR

13 10

OUTPUT CONTROL VARIABLES

IPRINT 5 PRINT CONTROL
 IPLOT 0 PLOT CONTROL
 OSCAL 0 HYDROGRAPH PLOT SCALE

17

HYDROGRAPH TIME DATA

NMIN 5 MINUTES IN COMPUTATION INTERVAL
 IDATE 1 3 STARTING DATE
 ITIME 8000 STARTING TIME
 NQ 300 NUMBER OF HYDROGRAPH ORDINATES
 NDATE 2 6 ENDING DATE
 NETIME 0055 ENDING TIME
 ICENT 15 CENTURY MARK

COMPUTATION INTERVAL .08 HOURS
 TOTAL TIME BASE 24.92 HOURS

ENGLISH UNITS

DRAINAGE AREA SQUARE MILES
 PRECIPITATION DEPTH INCHES
 LENGTH, ELEVATION FEET
 FLOW CUBIC FEET PER SECOND
 STORAGE VOLUME ACRE-Feet
 SURFACE AREA ACRES
 TEMPERATURE DEGREES FAHRENHEIT

20

MULTI-PLAN OPTION

NPLAN 3 NUMBER OF PLANS

26

MULTI-RATIO OPTION

RATIOS OF RUNOFF
1.00

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

OPERATION	STATION	AREA	PLAN	RATIOS APPLIED TO FLOWS		
				RATIO 1		
HYDROGRAPH AT	BA9	.56	1	FLOW	66.	
				TIME	12.67	
				2	FLOW	157.
					TIME	12.67
				3	FLOW	274.
					TIME	12.67
HYDROGRAPH AT	BA10	.67	1	FLOW	93.	
				TIME	12.83	
				2	FLOW	217.
					TIME	12.75
				3	FLOW	360.
					TIME	12.75
HYDROGRAPH AT	BAK	.02	1	FLOW	5.	
				TIME	12.08	
				2	FLOW	14.
					TIME	12.08
				3	FLOW	25.
					TIME	12.38

EXISTING

*** NORMAL END OF REC-1 ***

BASINS

```

*****
* FLOOD HYDROGRAPH PACKAGE (HEC-1)
* JUN 1998
* VERSION 4.1
*
* RUN DATE 18OCT06 TIME 11:29:40
*
*****
    
```

```

*****
* U.S. ARMY CORPS OF ENGINEERS
* HYDROLOGIC ENGINEERING CENTER
* 609 SECOND STREET
* DAVIS, CALIFORNIA 95616
* (916) 756-1104
*
*****
    
```

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

THIS PROGRAM REPLACES ALL PREVIOUS VERSIONS OF HEC-1 KNOWN AS HEC1 (JAN 73), HEC1G, HEC1DB, AND HEC1K.

THE DEFINITIONS OF VARIABLES -RTIMP- AND -RTIOR- HAVE CHANGED FROM THOSE USED WITH THE 1973-STYLE INPUT STRUCTURE. THE DEFINITION OF -XMSK- ON RM-CARD WAS CHANGED WITH REVISIONS DATED 28 SEP 81. THIS IS THE PORTANT77 VERSION. NEW OPTIONS: DAMBREAK OUTFLOW SUBMERGENCE, SINGLE EVENT DAMAGE CALCULATION, DSS:WRITE STAGE FREQUENCY, DSS:READ TIME SERIES AT DESIRED CALCULATION INTERVAL, LOSS RATE:GREEN AND AMPT INFILTRATION. KINEMATIC WAVE: NEW FINITE DIFFERENCE ALGORITHM.

1 HEC-1 INPUT PAGE 1

LINE	ID	1	2	3	4	5	6	7	8	9	10
1	ID										
2	ID										
3	ID										
4	ID										
5	ID										
6	ID										
7	ID										
8	ID										
9	ID										
10	ID										
11	UP	3									
12	IT	5									
13	IO	5									
	*DIAGRAM										
	* *****										
14	KK	9A	SUB-BASIN 9A								
15	KP	1									
16	BA	0.557									
17	PH			0.17	0.32	0.53	0.69	0.82	1.16	1.61	2.19
18	LS		8C								
19	UD	0.66									
20	KP	2									
21	PH			0.27	0.52	0.86	1.01	1.14	1.56	2.21	3.07
22	KP	3									
23	PH			0.40	0.76	1.27	1.37	1.48	1.92	2.73	3.91
	* *****										
24	KK	9B	SUB-BASIN 9B								
25	KP	1									
26	BA	0.13									
27	PH			0.17	0.32	0.53	0.69	0.82	1.16	1.61	2.19
28	LS		87								
29	UD	0.35									
30	KP	2									
31	PH			0.27	0.51	0.86	1.00	1.13	1.55	2.19	3.06
32	KP	3									
33	PH			0.40	0.76	1.27	1.37	1.47	1.92	2.71	3.96
	* *****										
34	KK	BETTS	COMBINE 9A, 9B AT BETTS								
35	HC	2									
	* *****										
36	ZZ										

SCHEMATIC DIAGRAM OF STREAM NETWORK

```

INPUT LINE (V) ROUTING (--->) DIVERSION OR PUMP FLOW
NO. (C) CONNECTOR (C---) RETURN OF DIVERTED OR PUMPED FLOW
14 9A
24 9B
34 BETTS.....
    
```

(***) RUNOFF ALSO COMPUTED AT THIS LOCATION

BASIN9

FLOOD HYDROGRAPH PACKAGE (HEC-1)
 JUN 1998
 VERSION 4.1
 RUN DATE 19CCT86 TIME 11:29:40

U.S. ARMY CORPS OF ENGINEERS
 HYDROLOGIC ENGINEERING CENTER
 609 SECOND STREET
 DAVIS, CALIFORNIA 95616
 (916) 756-1104

CARSON CITY
 SUMMERHAWK
 5, 25 and 100-year, 24-hour Event
 Pre-DEVELOPMENT
 (5-minute computation interval)
 10-14-2006

PLAN 1 IS 5-YEAR
 PLAN 2 IS 25-YEAR
 PLAN 3 IS 100-YEAR

13 IO OUTPUT CONTROL VARIABLES
 IPRINT 5 PRINT CONTROL
 IPLGT 0 PLOT CONTROL
 QSCL 3 HYDROGRAPH PLOT SCALE

17 HYDROGRAPH TIME DATA
 NMIN 5 MINUTES IN COMPUTATION INTERVAL
 IDATE 1 0 STARTING DATE
 ITIME 0000 STARTING TIME
 NQ 300 NUMBER OF HYDROGRAPH ORDINATES
 NDDATE 2 0 ENDING DATE
 NDTIME 0055 ENDING TIME
 ICENT 19 CENTURY MARK

COMPUTATION INTERVAL .05 HOURS
 TOTAL TIME BASE 24.92 HOURS

ENGLISH UNITS
 DRAINAGE AREA SQUARE MILES
 PRECIPITATION DEPTH INCHES
 LENGTH, ELEVATION FEET
 FLOW CUBIC FEET PER SECOND
 STORAGE VOLUME ACRE-Feet
 SURFACE AREA ACRES
 TEMPERATURE DEGREES FAHRENHEIT

19 MULTI-PLAN OPTION
 NPLAN 3 NUMBER OF PLANS

20 MULTI-RATIO OPTION
 RATIOS OF RUNOFF
 1.00

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

OPERATION	STATION	AREA	PLAN	RATIOS APPLIED TO FLOWS		
				FLOW	TIME	
+ HYDROGRAPHS AT	9A	.56	1	1.00		
				FLOW	68.	
				TIME	12.67	
				2	FLOW	157.
				TIME	12.67	
				3	FLOW	274.
TIME	12.67					
- HYDROGRAPHS AT	9B	.10	1	1.00		
				FLOW	56.	
				TIME	12.00	
				2	FLOW	119.
				TIME	12.00	
				3	FLOW	196.
TIME	12.00					
+ 2 COMBINED AT	BETTS	.66	1	1.00		
				FLOW	75.	
				TIME	12.67	
				2	FLOW	166.
				TIME	12.67	
				3	FLOW	292.
TIME	12.67					

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

BASIN10

FLOOD HYDROGRAPH PACKAGE (HEC-1)
 JUN 1998
 VERSION 4.1
 RUN DATE 18CCT08 TIME 11:26:57

U.S. ARMY CORPS OF ENGINEERS
 HYDROLOGIC ENGINEERING CENTER
 609 SECOND STREET
 DAVIS, CALIFORNIA 95616
 (916) 756-1134

```

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

THIS PROGRAM REPLACES ALL PREVIOUS VERSIONS OF HEC-1 KNOWN AS HEC1 (JAN 73), HEC1G, HEC1D, AND HEC1KW.
 THE DEFINITIONS OF VARIABLES -RTIMP- AND -RTIOP- HAVE CHANGED FROM THOSE USED WITH THE 1973-STYLE INPUT STRUCTURE.
 THE DEFINITION OF -AMSK- ON RM-CARD WAS CHANGED WITH REVISIONS DATED 26 SEP 81. THIS IS THE FORTRAN77 VERSION
 NEW OPTIONS: DAMBREAK OUTFLOW SUBMERGENCE, SINGLE EVENT DAMAGE CALCULATION, DSS:WRITE STAGE FREQUENCY,
 DSS:READ TIME SERIES AT DESIRED CALCULATION INTERVAL LOSS RATE:GREEN AND RMPT INFILTRATION
 KINEMATIC WAVE: NEW FINITE DIFFERENCE ALGORITHM

```

LINE ID.....1.....2.....3.....4.....5.....6.....7.....8.....9.....10
1 ID
2 ID CARSON CITY
3 ID SUMNERHAMX
4 ID 5, 25 and 100-year, 24-hour Event
5 ID POST-DEVELOPEMENT
6 ID (5-minute computation interval)
7 ID 10-14-2006
8 ID
9 ID PLAN 1 IS 5-YEAR
10 ID PLAN 2 IS 25-YEAR
11 ID PLAN 3 IS 100-YEAR
12 JP 3
13 IT 5 300
14 IO 5
15 *DIAGRAM
16 * *****
17 KK 100 SUB-BASIN 100
18 KP 1
19 BA 0.054
20 PH 0.17 0.32 0.53 0.68 0.81 1.15 1.59 2.16
21 LS 80
22 UD .18
23 KP 2
24 PH 0.27 0.51 0.86 1.00 1.13 1.55 2.19 3.04
25 KP 3
26 PH 0.40 0.76 1.27 1.37 1.47 1.92 2.71 3.86
27 * *****
28 KK 100 SUB-BASIN 100
29 KP 1
30 BA 0.024
31 PH 0.17 0.32 0.53 0.68 0.81 1.15 1.59 2.16
32 LS 80
33 UD 0.08
34 KP 2
35 PH 0.27 0.51 0.86 1.00 1.13 1.55 2.19 3.04
36 KP 3
37 PH 0.40 0.76 1.27 1.37 1.47 1.92 2.71 3.86
38 * *****
39 KK COM1 COMBINE 100 AND 100
40 HC 2
41 * *****
42 KK RT1 COM100 COM2
43 RM .094 .25
44 * *****
45 KK 100 SUB-BASIN 100
46 KP 1
47 BA 0.081
48 PH 0.17 0.32 0.53 0.68 0.81 1.15 1.59 2.16
49 LS 80
50 UD 0.19
51 KP 2
    
```

```

LINE ID.....1.....2.....3.....4.....5.....6.....7.....8.....9.....10
45 PH 0.27 0.51 0.86 1.00 1.13 1.55 2.19 3.04
46 KP 3
    
```

		BASIN13								
47	PH	0.40	0.76	1.27	1.27	1.47	1.92	2.71	3.86	

48	KK	RT2 ROUTE 10B TO COM2								
49	RM	.15	.25							

50	KK	10A SUB-BASIN 10A								
51	KP	1								
52	BA	0.311								
53	PH		0.17	0.32	0.53	0.68	0.81	1.15	1.59	2.16
54	LS		80							
55	UD	0.45								
56	KP	2								
57	PH		0.27	0.51	0.86	1.00	1.13	1.55	2.19	3.04
58	KP	3								
59	PH		0.40	0.76	1.27	1.37	1.47	1.92	2.71	3.86

60	KK	101 SUB-BASIN 101								
61	KP	1								
62	BA	0.022								
63	PH		0.17	0.32	0.53	0.68	0.81	1.15	1.59	2.16
64	LS		87							
65	UD	0.35								
66	KP	2								
67	PH		0.27	0.51	0.86	1.00	1.13	1.55	2.19	3.04
68	KP	3								
69	PH		0.40	0.76	1.27	1.37	1.47	1.92	2.71	3.86

70	KK	101 SUB-BASIN 101								
71	KP	1								
72	BA	0.037								
73	PH		0.17	0.32	0.53	0.68	0.81	1.15	1.59	2.16
74	LS		80							
75	UD	0.10								
76	KP	2								
77	PH		0.27	0.51	0.86	1.00	1.13	1.55	2.19	3.04
78	KP	3								
79	PH		0.40	0.76	1.27	1.37	1.47	1.92	2.71	3.86

80	KK	COM2 COMBINE COM1,10A,10A,101								
81	HC	5								

82	KK	RT3 ROUTE COM2 TO COM3								
83	RM	.158	.25							

HEC-1 INPUT

PAGE 3

LINE	ID	1	2	3	4	5	6	7	8	9	10
84	KK	10A SUB-BASIN 10A									
85	KP	1									
86	BA	0.032									
87	PH		0.17	0.32	0.53	0.68	0.81	1.15	1.59	2.16	
88	LS		87								
89	UD	0.03									
90	KP	2									
91	PH		0.27	0.51	0.86	1.00	1.13	1.55	2.19	3.04	
92	KP	3									
93	PH		0.40	0.76	1.27	1.37	1.47	1.92	2.71	3.86	

94	KK	10E SUB-BASIN 10E									
95	KP	1									
96	BA	0.092									
97	PH		0.17	0.32	0.53	0.68	0.81	1.15	1.59	2.16	
98	LS		80								
99	UD	0.52									
100	KP	2									
101	PH		0.27	0.51	0.86	1.00	1.13	1.55	2.19	3.04	
102	KP	3									
103	PH		0.40	0.76	1.27	1.37	1.47	1.92	2.71	3.86	

104	KK	10G SUB-BASIN 10G									
105	KP	1									
106	BA	0.024									
107	PH		0.17	0.32	0.53	0.68	0.81	1.15	1.59	2.16	
108	LS		80								
109	UD	0.26									
110	KP	2									
111	PH		0.27	0.51	0.86	1.00	1.13	1.55	2.19	3.04	
112	KP	3									
113	PH		0.40	0.76	1.27	1.37	1.47	1.92	2.71	3.86	

114	KK	COM3 COMBINE COM2,10E,10G,10J									
115	HC	4									

116	KK	RT4 ROUTE COM3 TO COM5									
117	RM	.112	.25								

BASIN10

118	KK	108 SUB-BASIN 108								
119	KP	1								
120	BA	0.012								
121	PH		0.17	0.32	0.53	0.68	0.81	1.15	1.59	2.16
122	LS		87							
123	UD	0.10								
124	KP	2								
125	PH		0.27	0.51	0.86	1.00	1.13	1.55	2.19	3.04
126	KP	3								
127	PH		0.40	0.76	1.27	1.37	1.47	1.92	2.71	3.86

HEC-1 INPUT

PAGE 4

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

128	KK	109 SUB-BASIN 109								
129	KP	1								
130	BA	0.051								
131	PH		0.17	0.32	0.53	0.68	0.81	1.15	1.59	2.16
132	LS		80							
133	UD	0.16								
134	KP	2								
135	PH		0.27	0.51	0.86	1.00	1.13	1.55	2.19	3.04
136	KP	3								
137	PH		0.40	0.76	1.27	1.37	1.47	1.92	2.71	3.86

138	KK	100 SUB-BASIN 100								
139	KP	1								
140	BA	0.006								
141	PH		0.17	0.32	0.53	0.68	0.81	1.15	1.59	2.16
142	LS		80							
143	UD	0.05								
144	KP	2								
145	PH		0.27	0.51	0.86	1.00	1.13	1.55	2.19	3.04
146	KP	3								
147	PH		0.40	0.76	1.27	1.37	1.47	1.92	2.71	3.86

KK COM4 COMBINE 108 AND 109
EC 2

KK RPS ROUTE TO COM5
RM .11 .25

152	KK	10K SUB-BASIN 10K								
153	KP	1								
154	BA	0.025								
155	PH		0.17	0.32	0.53	0.68	0.81	1.15	1.59	2.16
156	LS		87							
157	UD	0.07								
158	KP	2								
159	PH		0.27	0.51	0.86	1.00	1.13	1.55	2.19	3.04
160	KP	3								
161	PH		0.40	0.76	1.27	1.37	1.47	1.92	2.71	3.86

162	KK	10P SUB-BASIN 10P								
163	KP	1								
164	BA	0.012								
165	PH		0.17	0.32	0.53	0.68	0.81	1.15	1.59	2.16
166	LS		87							
167	UD	0.03								
168	KP	2								
169	PH		0.27	0.51	0.86	1.00	1.13	1.55	2.19	3.04
170	KP	3								
171	PH		0.40	0.76	1.27	1.37	1.47	1.92	2.71	3.86

HEC-1 INPUT

PAGE 5

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

KK COM5 COMBINE COM4,10K,10P,10P,COM3
EC 5

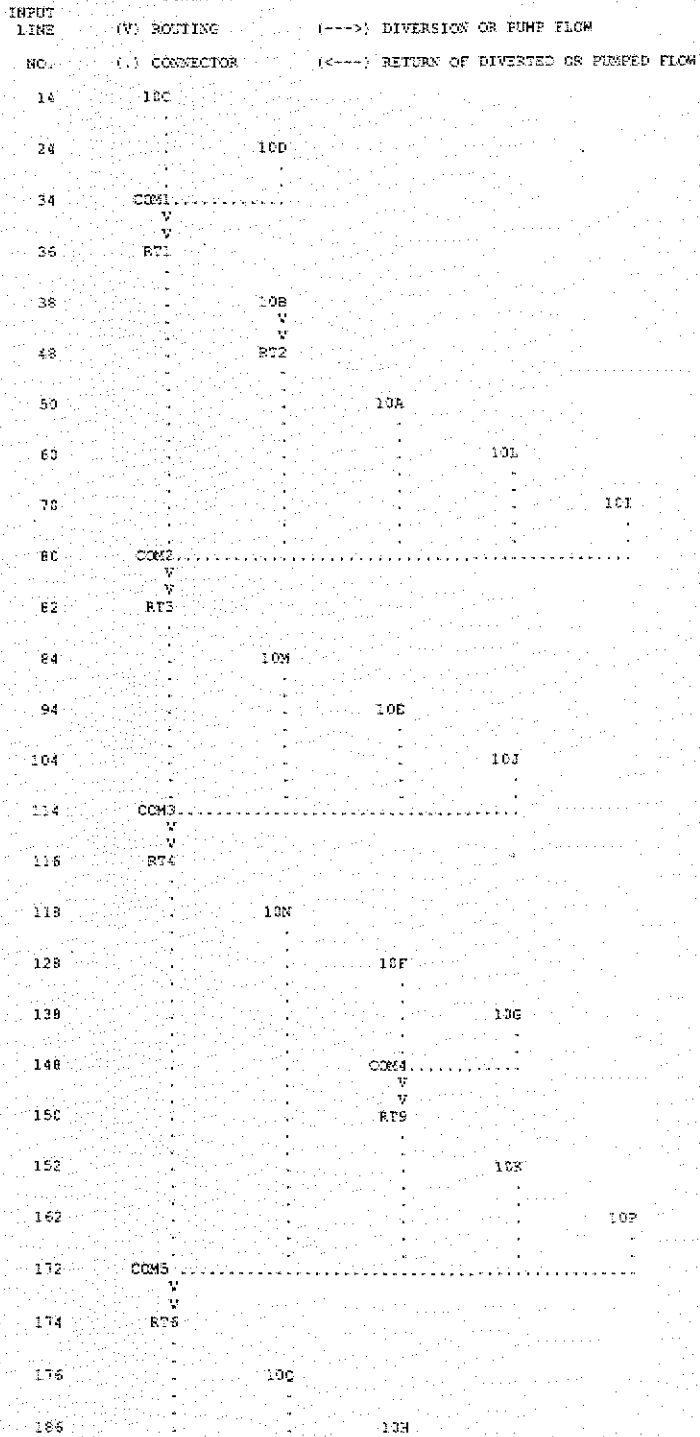
KK RPS ROUTE TO REDDIE ST
RM .103 .25

176	KK	10Q SUB-BASIN 10Q								
177	KP	1								
178	BA	0.007								
179	PH		0.17	0.32	0.53	0.68	0.81	1.15	1.59	2.16
180	LS		87							
181	UD	0.05								
182	KP	2								
183	PH		0.27	0.51	0.86	1.00	1.13	1.55	2.19	3.04
184	KP	3								
185	PH		0.40	0.76	1.27	1.37	1.47	1.92	2.71	3.86

KK 10R SUB-BASIN 10R
KP 1
BA .039

				BASIN10							
189	PH			0.17	0.32	0.53	0.68	0.81	1.15	1.59	2.15
190	LS	80									
191	UD	.09									
192	KP	2									
193	PH			0.27	0.51	0.86	1.00	1.13	1.55	2.19	3.04
194	KP	3									
195	PH			0.40	0.76	1.27	1.37	1.67	1.92	2.71	3.86
.....											
196	KX	RHDST RHODES ST									
197	HC	3									
.....											
198	ZI										

SCHEMATIC DIAGRAM OF STREAM NETWORK



BASIN10

196

RRDST

***** RUNCFF ALSO COMPUTED AT THIS LOCATION

 * FLOOD HYDROGRAPH PACKAGE (HEC-1) *
 * JUN 1998 *
 * VERSION 4.1 *
 *
 * RUN DATE 18JUN08 TIME 11:26:57 *

 * U.S. ARMY CORPS OF ENGINEERS *
 * HYDROLOGIC ENGINEERING CENTER *
 * 609 SECOND STREET *
 * DAVIS, CALIFORNIA 95616 *
 * (916) 756-1104 *

CARSON CITY
 SUMMERHAWK
 5, 25 and 100-year, 24-hour Event
 POST-DEVELOPEMENT
 (5-minute computation interval)
 10-18-2008

PLAN 1 IS 5-YEAR
 PLAN 2 IS 25-YEAR
 PLAN 3 IS 100-YEAR

13 IC

OUTPUT CONTROL VARIABLES

IPRNT 5 PRINT CONTROL
 IPLOT 0 PLOT CONTROL
 QSCAL 0. HYDROGRAPH PLOT SCALE

14

HYDROGRAPH TIME DATA

MMIN 5 MINUTES IN COMPUTATION INTERVAL
 IDATE 1 0 STARTING DATE
 ITIME 0000 STARTING TIME
 NQ 300 NUMBER OF HYDROGRAPH ORDINATES
 NDDATE 2 0 ENDING DATE
 NDTIME 0035 ENDING TIME
 ICENT 19 CENTURY MARK

COMPUTATION INTERVAL .08 HOURS
 TOTAL TIME BASE 24.92 HOURS

ENGLISH UNITS

DRAINAGE AREA SQUARE MILES
 PRECIPITATION DEPTH INCHES
 LENGTH, ELEVATION FEET
 FLOW CUBIC FEET PER SECOND
 STORAGE VOLUME ACRE-Feet
 SURFACE AREA ACRES
 TEMPERATURE DEGREES FAHRENHEIT

15

MULTI-PLAN OPTION

NPLAN 3 NUMBER OF PLANS

16

MULTI-RATIO OPTION

RATIOS OF RUNCFF
 1.00

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

OPERATION	STATION	AREA	PLAN	RATIOS APPLIED TO FLOWS	
				RATIO 1	
				1.00	
HYDROGRAPH AT					
+	13C	.06	1	FLOW	15.
				TIME	12.25
			2	FLOW	34.
				TIME	12.25
			3	FLOW	61.
				TIME	12.25
HYDROGRAPH AT					
+	18D	.32	1	FLOW	7.
				TIME	12.17
			2	FLOW	16.
				TIME	12.17
			3	FLOW	29.
				TIME	12.17
2 COMBINED AT					
+	COM1	.39	1	FLOW	28.
				TIME	12.17
			2	FLOW	48.
				TIME	12.17
			3	FLOW	85.
				TIME	12.17
ROUTED TO					
+	R11	.39	1	FLOW	15.

BASIN10

			2	TIME	12.33
				FLOW	43.
			3	TIME	12.25
				FLOW	77.
				TIME	12.25
HYDROGRAPH AT	10B	.03	1	FLOW	13.
				TIME	12.25
			2	FLOW	43.
				TIME	12.25
			3	FLOW	76.
				TIME	12.25
ROUTED TO	RT2	.06	1	FLOW	16.
				TIME	12.42
			2	FLOW	37.
				TIME	12.42
			3	FLOW	65.
				TIME	12.42
HYDROGRAPH AT	10C	.31	1	FLOW	44.
				TIME	12.53
			2	FLOW	103.
				TIME	12.53
			3	FLOW	183.
				TIME	12.53
HYDROGRAPH AT	10L	.02	1	FLOW	13.
				TIME	12.08
			2	FLOW	26.
				TIME	12.08
			3	FLOW	43.
				TIME	12.08
HYDROGRAPH AT	10I	.04	1	FLOW	11.
				TIME	12.17
			2	FLOW	25.
				TIME	12.17
			3	FLOW	44.
				TIME	12.17
5 COMBINED AT	COM2	.54	1	FLOW	79.
				TIME	12.42
			2	FLOW	183.
				TIME	12.42
			3	FLOW	323.
				TIME	12.42
ROUTED TO	RT3	.54	1	FLOW	74.
				TIME	12.58
			2	FLOW	172.
				TIME	12.58
			3	FLOW	303.
				TIME	12.58
HYDROGRAPH AT	10H	.03	1	FLOW	20.
				TIME	12.08
			2	FLOW	39.
				TIME	12.08
			3	FLOW	64.
				TIME	12.08
HYDROGRAPH AT	10E	.09	1	FLOW	12.
				TIME	12.58
			2	FLOW	28.
				TIME	12.58
			3	FLOW	49.
				TIME	12.58
HYDROGRAPH AT	10G	.02	1	FLOW	5.
				TIME	12.33
			2	FLOW	11.
				TIME	12.33
			3	FLOW	19.
				TIME	12.33
4 COMBINED AT	COM3	.69	1	FLOW	92.
				TIME	12.53
			2	FLOW	212.
				TIME	12.53
			3	FLOW	373.
				TIME	12.53
ROUTED TO	RT4	.69	1	FLOW	90.
				TIME	12.67
			2	FLOW	207.
				TIME	12.67

BASIN10

			3	FLOW	362.
				TIME	12.67
HYDROGRAPH AT	10F	.01	1	FLOW	6.
				TIME	12.17
			2	FLOW	11.
				TIME	12.17
			3	FLOW	19.
				TIME	12.17
HYDROGRAPH AT	10F	.06	1	FLOW	14.
				TIME	12.25
			2	FLOW	33.
				TIME	12.25
			3	FLOW	59.
				TIME	12.25
HYDROGRAPH AT	10G	.01	1	FLOW	2.
				TIME	12.08
			2	FLOW	5.
				TIME	12.08
			3	FLOW	9.
				TIME	12.08
2 COMBINED AT	COM4	.07	1	FLOW	15.
				TIME	12.25
			2	FLOW	35.
				TIME	12.25
			3	FLOW	62.
				TIME	12.25
ROUTED TO	RT9	.07	1	FLOW	14.
				TIME	12.33
			2	FLOW	32.
				TIME	12.33
			3	FLOW	58.
				TIME	12.33
HYDROGRAPH AT	10K	.03	1	FLOW	13.
				TIME	12.08
			2	FLOW	25.
				TIME	12.08
			3	FLOW	42.
				TIME	12.08
HYDROGRAPH AT	10P	.31	1	FLOW	8.
				TIME	12.06
			2	FLOW	15.
				TIME	12.06
			3	FLOW	25.
				TIME	12.06
5 COMBINED AT	COM5	.80	1	FLOW	101.
				TIME	12.58
			2	FLOW	229.
				TIME	12.58
			3	FLOW	499.
				TIME	12.58
ROUTED TO	RT6	.80	1	FLOW	99.
				TIME	12.75
			2	FLOW	225.
				TIME	12.67
			3	FLOW	392.
				TIME	12.67
HYDROGRAPH AT	10Q	.01	1	FLOW	4.
				TIME	12.08
			2	FLOW	8.
				TIME	12.08
			3	FLOW	14.
				TIME	12.08
HYDROGRAPH AT	10H	.01	1	FLOW	3.
				TIME	12.17
			2	FLOW	6.
				TIME	12.17
			3	FLOW	11.
				TIME	12.17
3 COMBINED AT	REDST	.82	1	FLOW	100.
				TIME	12.75
			2	FLOW	227.
				TIME	12.67
			3	FLOW	394.
				TIME	12.67

BASINIC

*** NORMAL END OF REC-1 ***

BASIN 9



**POINT PRECIPITATION
FREQUENCY ESTIMATES
FROM NOAA ATLAS 14**



Nevada 39.1389 N 119.796 W 5564 feet
 from "Precipitation-Frequency Atlas of the United States" NOAA Atlas 14, Volume 1, Version 4
 G.M. Bonnin, D. Martin, B. Lin, T. Parzybok, M. Yekta, and D. Riley
 NOAA, National Weather Service, Silver Spring, Maryland, 2006

Extracted: Sun Oct 15 2006

Confidence Limits Seasonality Location Maps Other Info GIS data Maps Help D

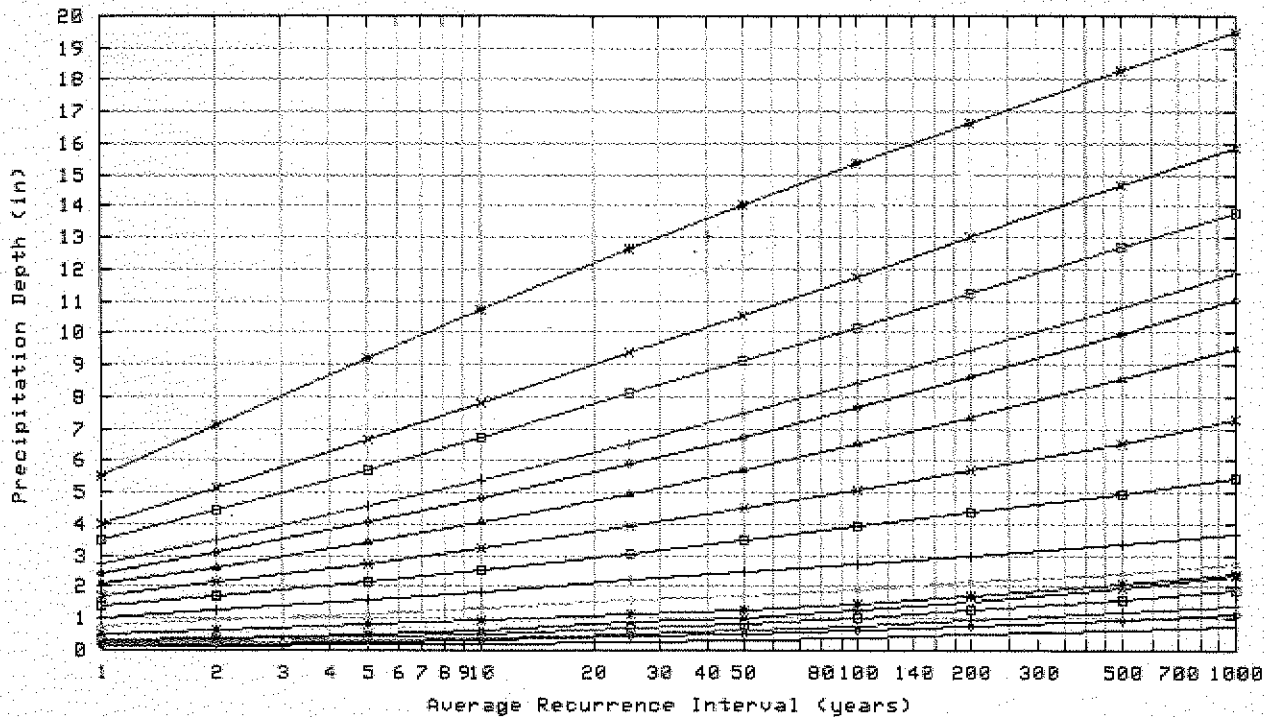
Precipitation Frequency Estimates (inches)																		
ARI* (years)	5 min	10 min	15 min	30 min	60 min	120 min	3 hr	6 hr	12 hr	24 hr	48 hr	4 day	7 day	10 day	20 day	30 day	45 day	60 day
1	0.10	0.15	0.19	0.26	0.32	0.44	0.53	0.76	1.03	1.38	1.70	2.07	2.44	2.74	3.47	4.02	4.80	5.55
2	0.13	0.19	0.24	0.32	0.40	0.54	0.66	0.94	1.29	1.73	2.14	2.63	3.10	3.49	4.42	5.13	6.13	7.12
5	0.17	0.26	0.32	0.43	0.53	0.69	0.82	1.16	1.61	2.19	2.74	3.41	4.04	4.56	5.74	6.66	7.95	9.22
10	0.21	0.32	0.39	0.53	0.65	0.81	0.95	1.33	1.86	2.56	3.23	4.06	4.80	5.41	6.74	7.81	9.30	10.72
25	0.27	0.41	0.52	0.69	0.86	1.01	1.14	1.56	2.21	3.07	3.92	4.98	5.88	6.57	8.10	9.37	11.08	12.63
50	0.33	0.51	0.63	0.84	1.04	1.18	1.30	1.74	2.47	3.48	4.48	5.72	6.74	7.49	9.13	10.56	12.41	14.01
100	0.40	0.61	0.76	1.02	1.27	1.37	1.48	1.92	2.73	3.91	5.07	6.51	7.66	8.45	10.19	11.77	13.75	15.36
200	0.49	0.74	0.92	1.24	1.53	1.61	1.71	2.14	3.01	4.35	5.69	7.36	8.63	9.44	11.26	13.00	15.07	16.66
500	0.62	0.95	1.18	1.58	1.96	2.02	2.08	2.44	3.37	4.96	6.57	8.56	9.98	10.82	12.69	14.64	16.81	18.29
1000	0.75	1.14	1.41	1.90	2.35	2.40	2.44	2.71	3.66	5.44	7.27	9.54	11.08	11.90	13.79	15.89	18.12	19.46

Text version of table

* These precipitation frequency estimates are based on a partial duration series. ARI is the Average Recurrence Interval. Please refer to the documentation for more information. NOTE: Formatting forces estimates near zero to appear as zero.

BASIN 9

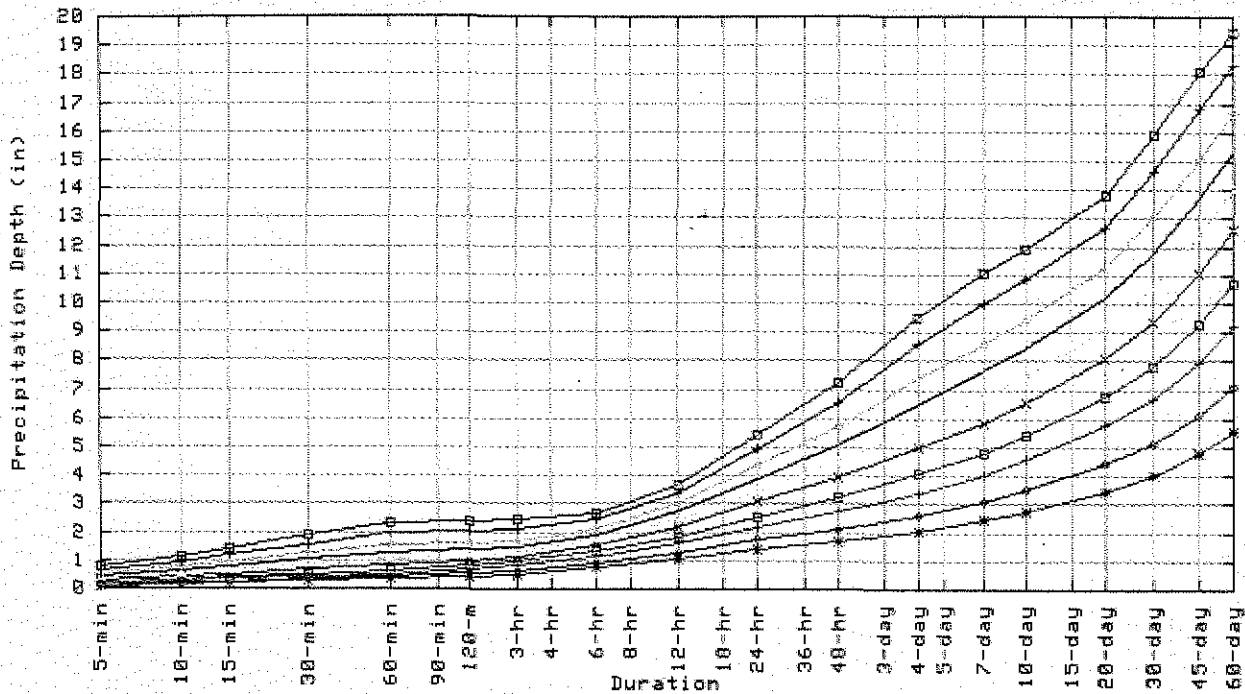
Partial duration based Point Precipitation Frequency Estimates Version: 4
 39.1389 N 119.796 W 5564 ft



Sun Oct 15 22:33:40 2006

Duration			
5-min	—	48-hr	+
10-min	•	4-day	•
15-min	+	7-day	+
30-min	o	10-day	+
60-min	+	20-day	o
3-hr	•	30-day	+
6-hr	+	60-day	•
12-hr	+		
24-hr	o		

Partial duration based Point Precipitation Frequency Estimates Version: 4
 39.1389 N 119.796 W 5564 ft



Sun Oct 15 22:33:40 2006

Average Recurrence Interval (years)	
1	*
2	+
5	+
10	+
25	*
100	—
500	+
1000	+

Confidence Limits -

* Upper bound of the 90% confidence interval Precipitation Frequency Estimates (inches)																		
ARI** (years)	5 min	10 min	15 min	30 min	60 min	120 min	3 hr	6 hr	12 hr	24 hr	48 hr	4 day	7 day	10 day	20 day	30 day	45 day	60 day
1	0.12	0.18	0.23	0.30	0.38	0.50	0.59	0.84	1.15	1.52	1.91	2.36	2.77	3.10	3.90	4.50	5.36	6.21
2	0.15	0.23	0.28	0.38	0.47	0.62	0.74	1.05	1.44	1.92	2.41	3.00	3.52	3.96	4.98	5.75	6.84	7.96
5	0.20	0.30	0.37	0.50	0.62	0.78	0.92	1.29	1.80	2.42	3.09	3.90	4.60	5.18	6.45	7.45	8.87	10.30
10	0.24	0.37	0.46	0.62	0.77	0.93	1.06	1.48	2.09	2.83	3.64	4.64	5.47	6.14	7.58	8.74	10.38	11.98
25	0.32	0.49	0.61	0.82	1.01	1.15	1.28	1.75	2.49	3.40	4.44	5.69	6.72	7.47	9.10	10.49	12.39	14.12
50	0.40	0.60	0.74	1.00	1.24	1.36	1.48	1.96	2.80	3.85	5.08	6.56	7.71	8.53	10.28	11.85	13.92	15.71
100	0.48	0.74	0.91	1.23	1.52	1.61	1.69	2.19	3.14	4.34	5.77	7.49	8.78	9.64	11.52	13.26	15.46	17.27
200	0.60	0.91	1.12	1.51	1.87	1.91	1.99	2.46	3.49	4.85	6.53	8.48	9.92	10.81	12.77	14.70	17.01	18.78
500	0.78	1.18	1.47	1.98	2.44	2.45	2.47	2.86	4.00	5.57	7.59	9.94	11.58	12.51	14.52	16.71	19.11	20.73
1000	0.95	1.44	1.79	2.41	2.98	3.01	3.04	3.22	4.40	6.17	8.49	11.18	12.96	13.86	15.91	18.26	20.75	22.19

* The upper bound of the confidence interval at 90% confidence level is the value which 5% of the simulated quantile values for a given frequency are greater than.
 ** These precipitation frequency estimates are based on a partial duration series. ARI is the Average Recurrence Interval.
 Please refer to the documentation for more information. NOTE: Formatting prevents estimates near zero to appear as zero.

* Lower bound of the 90% confidence interval																		
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Precipitation Frequency Estimates (inches)

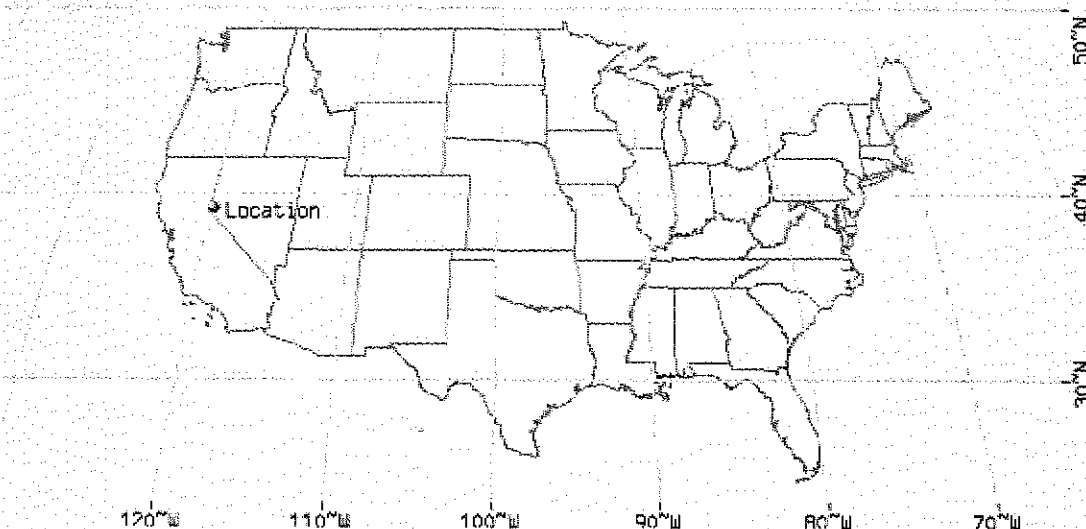
ARI** (years)	5 min	10 min	15 min	30 min	60 min	120 min	3 hr	6 hr	12 hr	24 hr	48 hr	4 day	7 day	10 day	20 day	30 day	45 day	60 day
1	0.09	0.13	0.17	0.22	0.28	0.39	0.48	0.68	0.92	1.25	1.51	1.83	2.16	2.42	3.08	3.59	4.29	4.95
2	0.11	0.17	0.21	0.28	0.35	0.48	0.60	0.85	1.15	1.57	1.91	2.32	2.74	3.09	3.94	4.58	5.48	6.35
5	0.14	0.22	0.27	0.37	0.46	0.61	0.74	1.04	1.44	1.98	2.44	3.00	3.56	4.02	5.11	5.93	7.09	8.21
10	0.18	0.27	0.34	0.45	0.56	0.71	0.85	1.19	1.65	2.31	2.87	3.56	4.23	4.75	5.97	6.94	8.28	9.54
25	0.23	0.34	0.43	0.57	0.71	0.86	1.00	1.38	1.93	2.75	3.46	4.33	5.14	5.73	7.13	8.28	9.81	11.19
50	0.27	0.41	0.50	0.68	0.84	0.98	1.12	1.52	2.13	3.10	3.92	4.93	5.85	6.49	7.99	9.26	10.94	12.38
100	0.31	0.48	0.59	0.79	0.98	1.12	1.25	1.65	2.33	3.45	4.41	5.57	6.58	7.26	8.86	10.26	12.05	13.51
200	0.36	0.55	0.69	0.92	1.14	1.27	1.41	1.80	2.52	3.81	4.90	6.22	7.35	8.04	9.72	11.23	13.14	14.59
500	0.44	0.67	0.83	1.11	1.38	1.52	1.67	2.00	2.75	4.28	5.55	7.12	8.37	9.10	10.83	12.51	14.48	15.91
1000	0.50	0.76	0.94	1.27	1.57	1.75	1.91	2.17	2.92	4.63	6.06	7.81	9.16	9.90	11.64	13.46	15.48	16.84

* The lower bound of the confidence interval at 90% confidence level is the value which 5% of the simulated quantile values for a given frequency are less than.

** These precipitation frequency estimates are based on a partial duration maxima series. ARI is the Average Recurrence Interval.

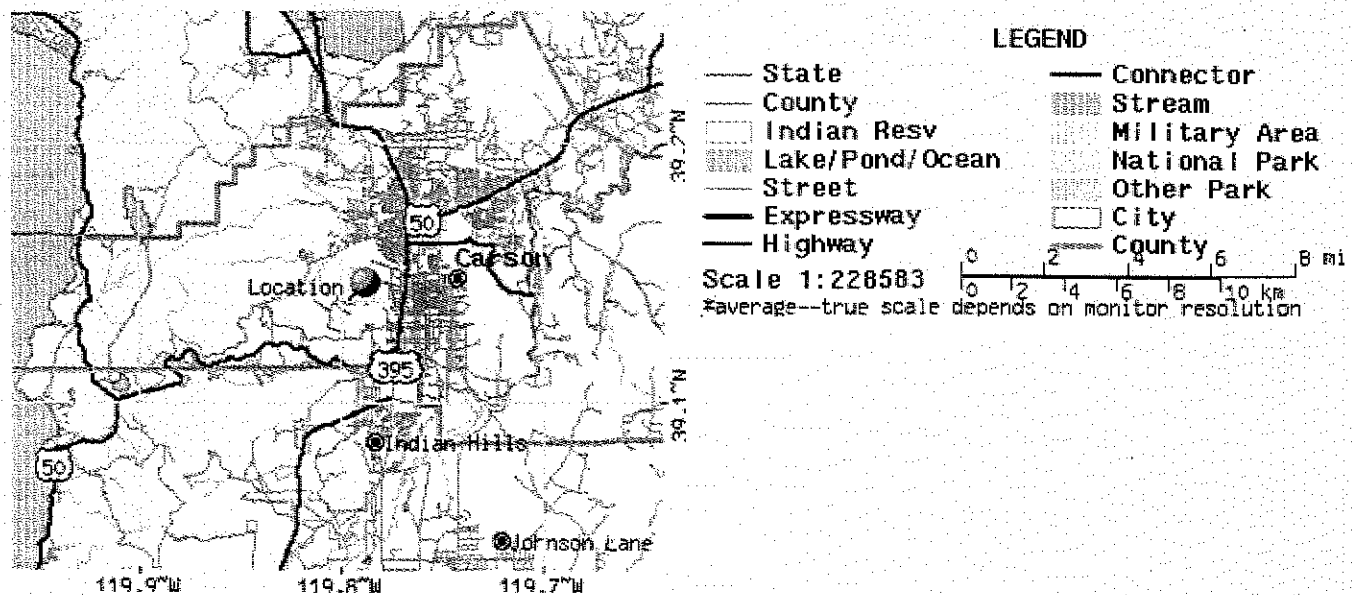
Please refer to the [documentation](#) for more information. NOTE: Formatting prevents estimates near zero to appear as zero.

Maps -



These maps were produced using a direct map request from the U.S. Census Bureau Mapping and Cartographic Resources Tiger Map Server.

Please read disclaimer for more information.



Other Maps/Photographs -

View [USGS digital orthophoto quadrangle \(DOQ\)](#) covering this location from TerraServer; [USGS Aerial Photograph](#) may also be available from this site. A DOQ is a computer-generated image of an aerial photograph in which image displacement caused by terrain relief and camera tilts has been removed. It combines the image characteristics of a photograph with the geometric qualities of a map. Visit the [USGS](#) for more information.

Watershed/Stream Flow Information -

Find the [Watershed](#) for this location using the U.S. Environmental Protection Agency's site.

Climate Data Sources -

Precipitation frequency results are based on data from a variety of sources, but largely NCDC. The following links provide general information about observing sites in the area, regardless of if their data was used in this study. For detailed information about the stations used in this study, please refer to our documentation.

Using the [National Climatic Data Center's \(NCDC\)](#) station search engine, locate other climate stations within:

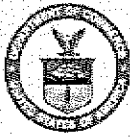
...OR... of this location (39.1389/-119.796). Digital ASCII data can be obtained directly from [NCDC](#).

Find [Natural Resources Conservation Service \(NRCS\) SNOTEL \(SNOWpack TELemetry\)](#) stations by visiting the [Western Regional Climate Center's state-specific SNOTEL station maps](#).

Hydrometeorological Design Studies Center
DOC/NOAA/National Weather Service
1325 East-West Highway
Silver Spring, MD 20910
(301) 713-1669
Questions?: HDSC.Questions@noaa.gov

[Disclaimer](#)

BASIN 10



**POINT PRECIPITATION
FREQUENCY ESTIMATES
FROM NOAA ATLAS 14**



Nevada 39.149661 N 119.797304 W 5606 feet

from "Precipitation-Frequency Atlas of the United States" NOAA Atlas 14, Volume 1, Version 4
G.M. Bonnin, D. Martin, B. Lin, T. Parzybok, M. Yekta, and D. Riley
NOAA, National Weather Service, Silver Spring, Maryland, 2006

Extracted: Fri Oct 13 2006

- Confidence Limits
- Seasonality
- Location Maps
- Other Info.
- GIS data
- Maps
- Help
- D

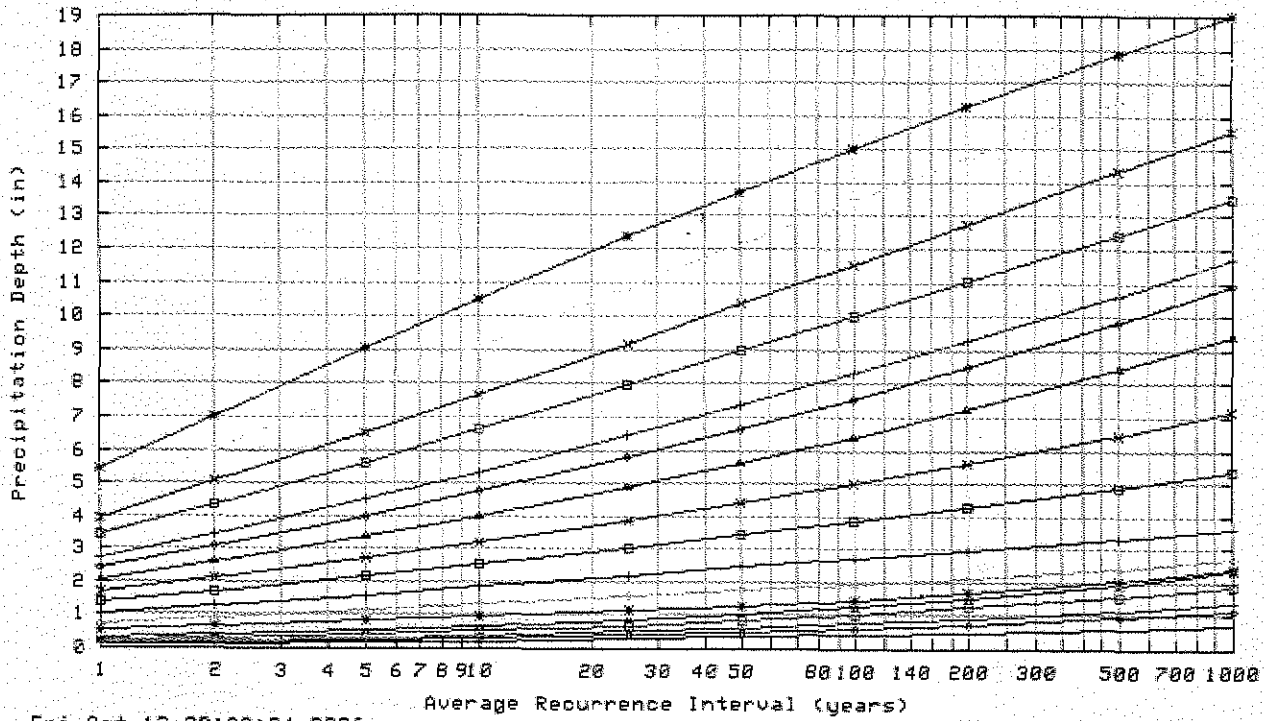
Precipitation Frequency Estimates (inches)																		
ARI* (years)	5 min	10 min	15 min	30 min	60 min	120 min	3 hr	6 hr	12 hr	24 hr	48 hr	4 day	7 day	10 day	20 day	30 day	45 day	60 day
1	0.10	0.15	0.19	0.26	0.32	0.44	0.53	0.75	1.02	1.37	1.68	2.04	2.41	2.70	3.41	3.95	4.71	5.44
2	0.13	0.19	0.24	0.32	0.40	0.54	0.66	0.93	1.27	1.72	2.11	2.59	3.06	3.44	4.34	5.04	6.02	6.98
5	0.17	0.26	0.32	0.43	0.53	0.68	0.81	1.15	1.59	2.16	2.70	3.37	3.99	4.50	5.64	6.53	7.79	9.03
10	0.21	0.32	0.39	0.53	0.65	0.81	0.95	1.32	1.85	2.53	3.19	4.00	4.74	5.33	6.62	7.67	9.12	10.50
25	0.27	0.41	0.51	0.69	0.86	1.00	1.13	1.55	2.19	3.04	3.87	4.91	5.79	6.47	7.95	9.19	10.86	12.37
50	0.33	0.51	0.63	0.84	1.04	1.18	1.29	1.73	2.45	3.44	4.42	5.63	6.64	7.37	8.96	10.35	12.15	13.71
100	0.40	0.61	0.76	1.02	1.27	1.37	1.47	1.92	2.71	3.86	5.00	6.42	7.54	8.32	10.00	11.54	13.45	15.03
200	0.49	0.74	0.92	1.24	1.53	1.61	1.70	2.13	2.98	4.30	5.61	7.25	8.49	9.29	11.05	12.73	14.74	16.29
500	0.62	0.95	1.18	1.58	1.96	2.02	2.08	2.43	3.34	4.90	6.47	8.43	9.82	10.64	12.45	14.34	16.42	17.86
1000	0.75	1.14	1.41	1.90	2.35	2.40	2.44	2.70	3.63	5.38	7.16	9.39	10.89	11.70	13.53	15.56	17.68	19.00

Text version of table

* These precipitation frequency estimates are based on a partial duration series. ARI is the Average Recurrence Interval. Please refer to the documentation for more information. NOTE: Formatting forces estimates near zero to appear as zero.

BASIN 10

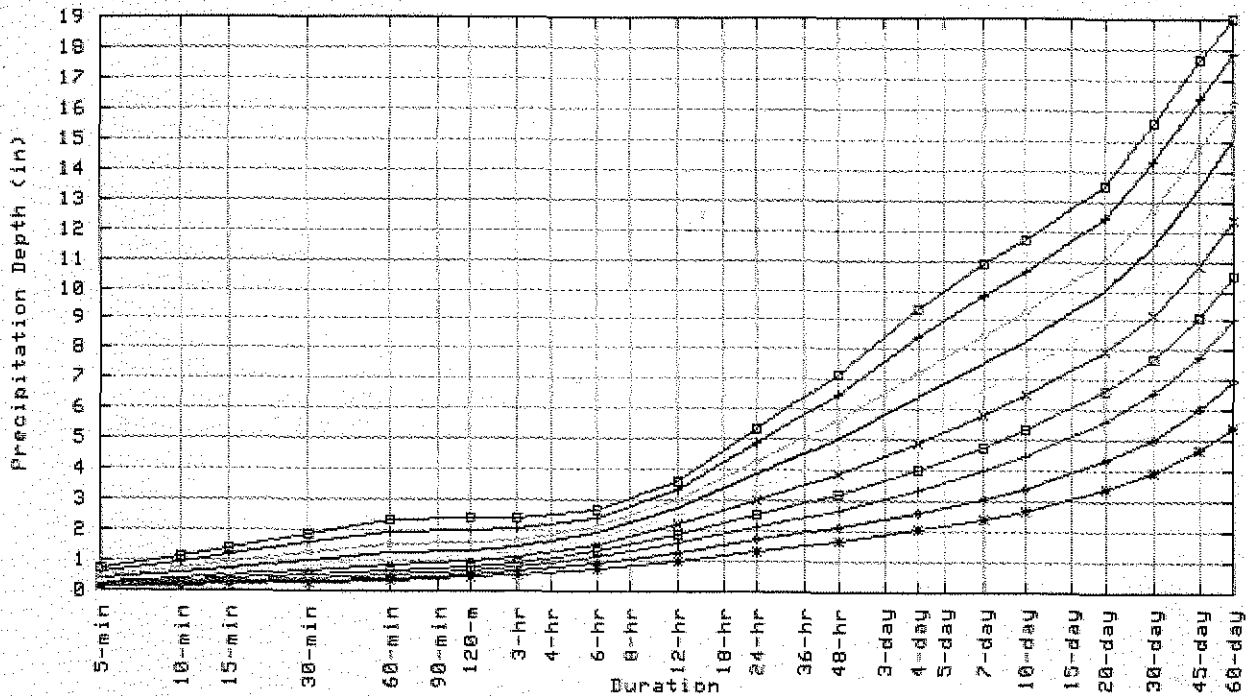
Partial duration based Point Precipitation Frequency Estimates Version: 4
 39.149661 N 119.797304 W 5606 ft



Fri Oct 13 20:08:34 2006

Duration			
5-min	1-hr	48-hr	30-day
10-min	3-hr	4-day	10-day
15-min	6-hr	7-day	60-day
30-min	12-hr	10-day	
60-min	24-hr	20-day	

Partial duration based Point Precipitation Frequency Estimates Version: 4
 39.149661 N 119.797304 W 5606 ft



Fri Oct 13 20:08:34 2006

Average Recurrence Interval (years)	
1	—
2	—
5	—
10	—
25	—
50	—
100	—
200	—
500	—
1000	—

Confidence Limits -

* Upper bound of the 90% confidence interval Precipitation Frequency Estimates (inches)																		
ARI** (years)	5 min	10 min	15 min	30 min	60 min	120 min	3 hr	6 hr	12 hr	24 hr	48 hr	4 day	7 day	10 day	20 day	30 day	45 day	60 day
1	0.12	0.18	0.23	0.30	0.38	0.50	0.59	0.83	1.14	1.51	1.89	2.33	2.73	3.06	3.83	4.42	5.26	6.09
2	0.15	0.23	0.28	0.38	0.47	0.61	0.73	1.04	1.43	1.90	2.38	2.96	3.47	3.91	4.89	5.64	6.71	7.80
5	0.20	0.30	0.37	0.50	0.62	0.78	0.91	1.28	1.79	2.40	3.05	3.85	4.54	5.10	6.34	7.31	8.69	10.09
10	0.24	0.37	0.46	0.62	0.77	0.92	1.06	1.47	2.07	2.80	3.60	4.57	5.39	6.05	7.44	8.58	10.17	11.73
25	0.32	0.49	0.61	0.82	1.01	1.15	1.28	1.74	2.47	3.37	4.38	5.61	6.61	7.35	8.94	10.29	12.13	13.82
50	0.39	0.60	0.74	1.00	1.24	1.36	1.47	1.95	2.78	3.81	5.01	6.46	7.59	8.40	10.10	11.61	13.62	15.38
100	0.48	0.74	0.91	1.23	1.52	1.60	1.69	2.18	3.11	4.29	5.69	7.38	8.64	9.48	11.31	12.99	15.12	16.90
200	0.59	0.91	1.12	1.51	1.87	1.91	1.99	2.45	3.46	4.80	6.43	8.35	9.76	10.63	12.53	14.40	16.62	18.36
500	0.78	1.18	1.47	1.97	2.44	2.45	2.47	2.85	3.96	5.50	7.48	9.79	11.39	12.30	14.25	16.36	18.65	20.25
1000	0.95	1.44	1.79	2.41	2.98	3.01	3.04	3.21	4.36	6.09	8.36	11.00	12.73	13.63	15.61	17.87	20.23	21.66

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* Lower bound of the 90% confidence interval																	
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Precipitation Frequency Estimates (inches)

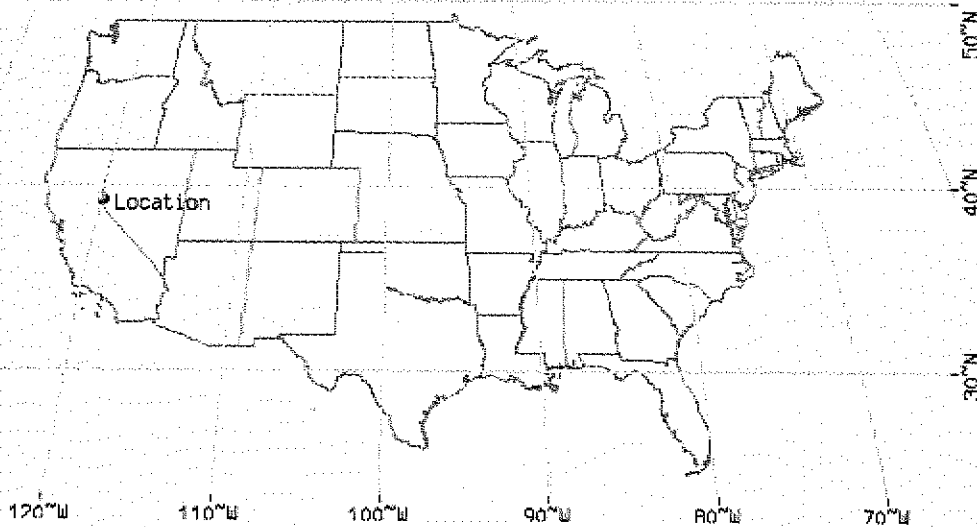
ARI** (years)	5 min	10 min	15 min	30 min	60 min	120 min	3 hr	6 hr	12 hr	24 hr	48 hr	4 day	7 day	10 day	20 day	30 day	45 day	60 day
1	0.09	0.13	0.17	0.22	0.28	0.39	0.47	0.68	0.91	1.24	1.50	1.81	2.13	2.38	3.03	3.52	4.21	4.85
2	0.11	0.17	0.21	0.28	0.35	0.48	0.59	0.84	1.14	1.55	1.89	2.29	2.70	3.04	3.87	4.49	5.37	6.22
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25	0.23	0.34	0.42	0.57	0.71	0.86	0.99	1.37	1.91	2.72	3.41	4.26	5.07	5.64	7.00	8.12	9.61	10.96
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1000	0.50	0.76	0.94	1.27	1.57	1.75	1.91	2.16	2.90	4.58	5.96	7.69	9.01	9.74	11.42	13.18	15.12	16.45

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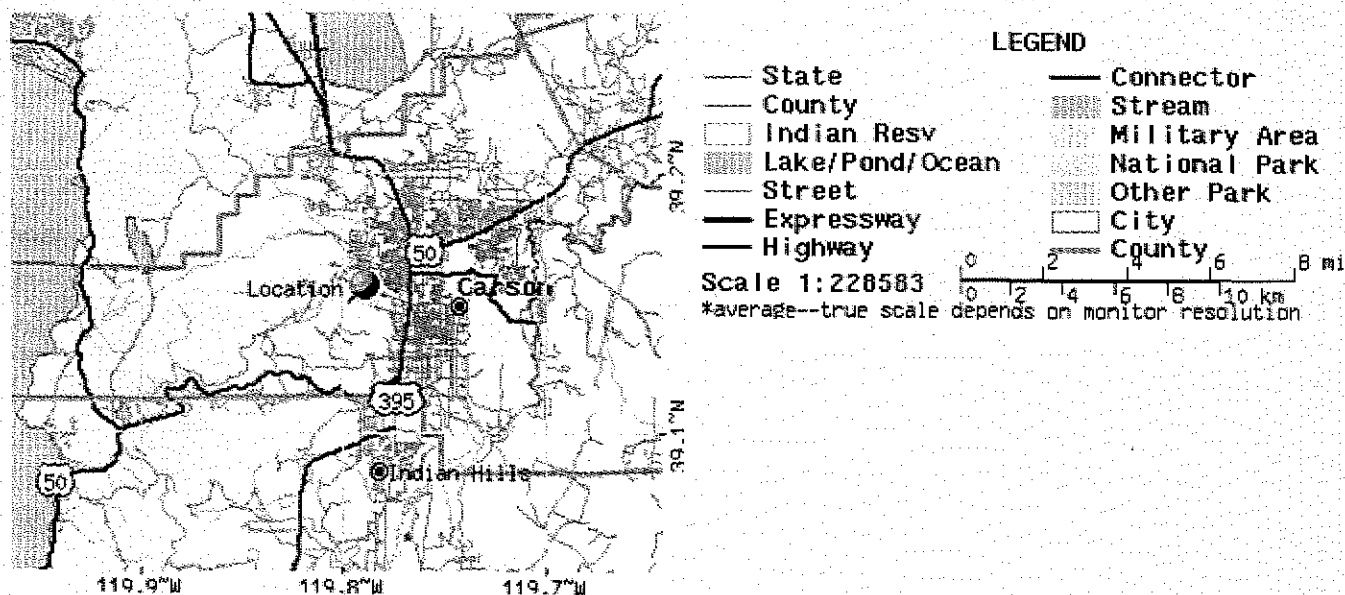
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Hydrometeorological Design Studies Center
DOC/NOAA/National Weather Service
1325 East-West Highway
Silver Spring, MD 20910
(301) 713-1669
Questions?: HDSC_Questions@noaa.gov

[Disclaimer](#)

Water System

**Conceptual Water Analysis
for
Summerhawk Common Area Subdivision**

**Prepared for:
Syncon Homes
990 Ironwood Drive
Minden, Nevada 89423**

**Prepared by:
Capital Engineering
P.O. Box 3750
Carson City, Nevada 89702**

October, 2006

**Conceptual Water Analysis
For
Summerhawk Common Area Subdivision**

The Summerhawk Common Area Subdivision is a 201 lot residential development located in southwest Carson City, Nevada. The project is being developed by Syncon Homes and this study supports the Tentative Map for the proposed project.

The development is located near the current western terminus of Rhodes Street and the western terminus of Betts Street which are both accessed off of South Curry Street. The project is located in the foothills with the terrain sloping from west to east. The project site is currently undeveloped with significant slopes covered in field grasses that have grown subsequent to fires that have burned the site. The soils generally are rocky in nature with soil overburden that supports the grass growth.

The project acreage consists of 548 acres with development of the 201 lots occurring within 67 acres or 12% of the site. The remainder of the site will be dedicated to Carson City for Open Space, pathways, and parks.

Included herein is an aerial photo with the proposed project superimposed along with the site topography. This map provides a good overview of the site.

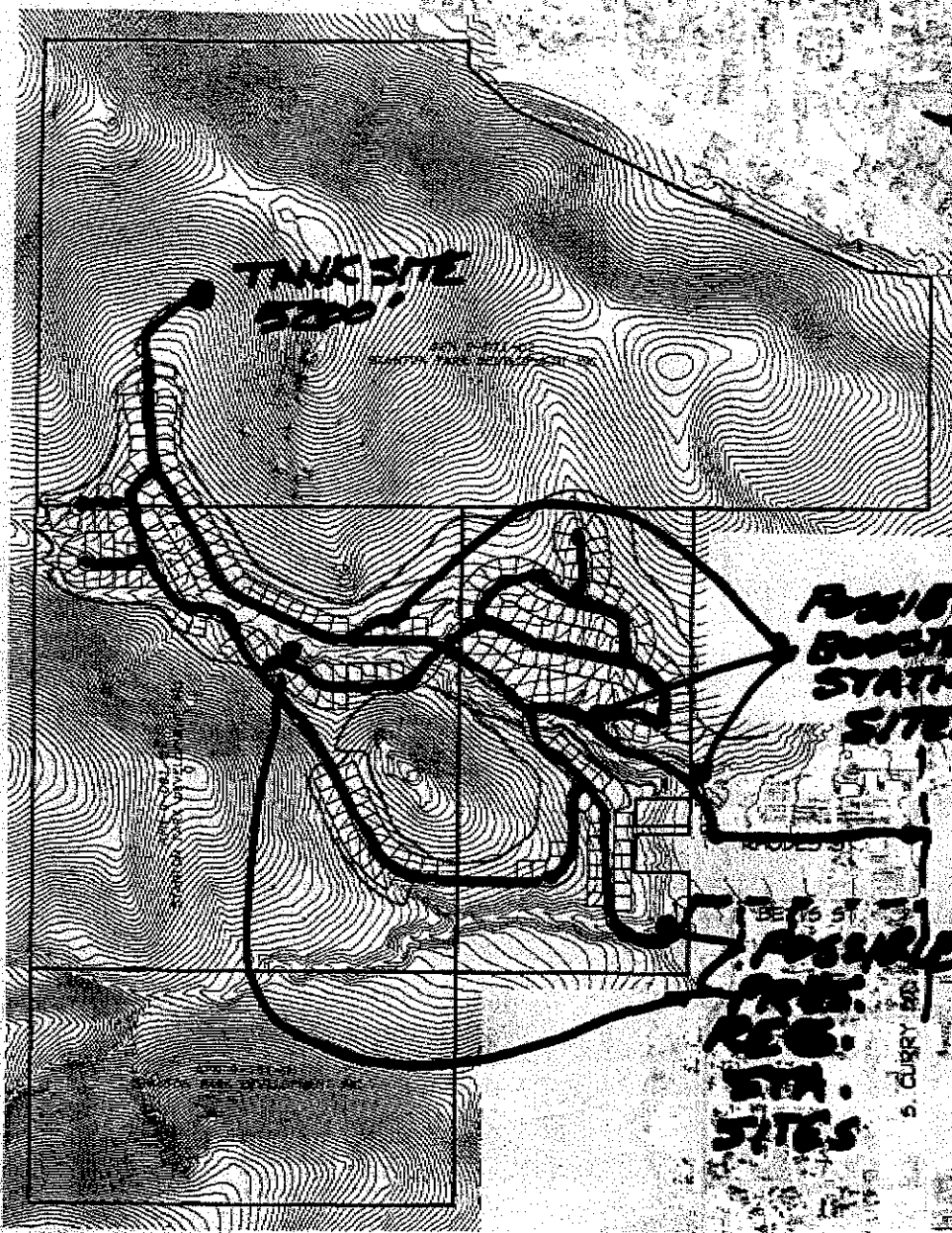
The proposed project will expand the Carson City water system by extending water main from Curry Street up Rhodes and through the project site. The existing water system along Curry, Rhodes, and Betts is within the Carson City 4960 water pressure zone (See the Carson City pressure zone map enclosed). The lots for the subdivision range in elevation from 4814 to 4963 feet. To accommodate the increased elevation, a water booster station will be required to boost water to a new tank site at an approximate elevation of 5200 feet. This will provide a minimum pressure of 60 psi at the highest home site. Pressure regulators will also be required to accommodate the homes in the lower elevations of the site due to the new zone being developed to 5200 feet.

The existing system within Betts and Rhodes includes 6" mains and fire flow tests for the existing system indicates that the water system can produce the required flows for demands for 201 homes as well as required residential fire flows from Rhodes Street based on available water of 2080 GPM at 20 psi residual off of the existing 6" line within Rhodes. Water main will be required to be upsized along Rhodes from Curry Street to provide source for the booster station and the subdivision.

The water system will be designed to meet Carson City and NAC requirements. The anticipated average demand for the subdivision is approximately 0.5 acre feet annually per unit plus the requirements of three small parks. This equates to approximately 500 gallons per day per unit average demand and peaking utilizing a peaking factor of 2.5 to 3 of 1250 gpd to 1500 gpd. This results in a demand of 0.9 to 1 gpm per unit peak demand.

A full analysis will be provided with the final design of the project. An addition to the Carson City model will help provide a true model of system delivery at the Curry Street connection as well as help the modeling scenario associated with connecting a booster station to the Carson City system.

In summary, the Summerhawk system can be serviced by providing an expansion of the Carson City system via main extension to the site, a booster station, pressure regulating stations, and a new tank at an approximate elevation of 5200 feet..



1:1000

PROPOSED
SUMMERHAWK
DEVELOPMENT
OCT. 2006

U.S. HWY 395

POSSIBLE
REG.
SIT.
SITES

SUMMERHAWK WATER SCHEMATIC

DEVELOPMENT SERVICES DEPARTMENT

ADMINISTRATION
3505 Butti Way
Carson City, NV 89701-3498
Ph: 775-887-2355
Fc: 775-887-2112

BUILDING and SAFETY DIVISION PERMIT CENTER
2621 Northgate Lane, Suite 6
Carson City, NV 89706-1319
Ph: 775-887-1810
Fc: 775-887-2262

CAPITAL PROJECTS
3505 Butti Way
Carson City, NV 89701-3498
Ph: 775-887-2355
Fc: 775-887-2112

CONTRACTS
3505 Butti Way
Carson City, NV 89701-3498
Ph: 775-887-2355
Fc: 775-887-2112

ENGINEERING DIVISION
2621 Northgate Lane, Suite 64
Carson City, NV 89706-1319
Ph: 775-887-2300
Fc: 775-887-2283

FLEET SERVICES
3303 Butti Way, Building 2
Carson City, NV 89701-3498
Ph: 775-887-2356
Fc: 775-887-2258

PLANNING DIVISION
2621 Northgate Lane, Suite 62
Carson City, NV 89706-1319
Ph: 775-887-2180
Fc: 775-887-2278

PUBLIC WORKS OPERATIONS (Water, Sewer, Wastewater, Streets, Landfill, Environmental)
3505 Butti Way
Carson City, NV 89701-3498
Ph: 775-887-2355
Fc: 775-887-2112

TRANSPORTATION
3505 Butti Way
Carson City, NV 89701-3498
Ph: 775-887-2355
Fc: 775-887-2112

CARSON CITY NEVADA
Consolidated Municipality and State Capital



**DEVELOPMENT SERVICES - PUBLIC WORKS OPERATIONS
FIRE FLOW DATA SHEET**

Testing Personnel: G. PERRY, KEVIN A, JASON C

Date of Test: 9/7/06 Time of Test: 7:55 Am

Requested By: PAUL DALY (CAPITAL ENG) Phone: 882-5630 x 222

Fax: 885-7282

Test Locations: (Street and Cross Street)
RHODES & CURRY

Pressure Zone: 4880

Comments: _____

Mainline Size: 6"

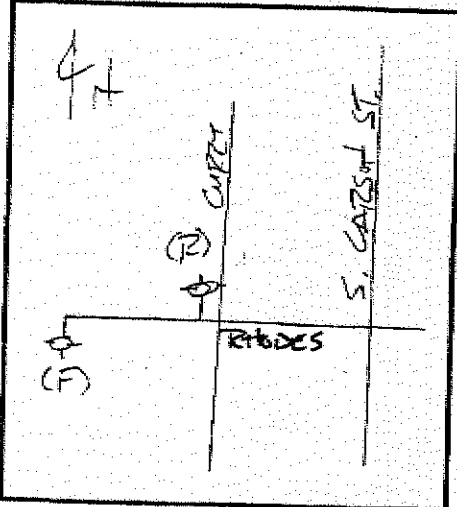
Pressure: Static (S) 100 PSI

Residual (R) 75 PSI

Pilot (P) 50 PSI

Pitot Flow Value 1115 GPM

Exit Coefficient (C) .845 Exit Diameter (inches) (D) 2.5"



Q = Flow Quantity From Hydrant

$$Q = (29.83) \times (C) \times (D)^2 \times (\sqrt{P})$$

$$Q = (29.83) \times (.845) \times (6.25) \times (7.07)$$

$$Q_1 = 1113.97 \text{ Gallons Per Minute}$$

Available Water Calculation:

$$D_1 = (S) - (R)$$

$$D_1 = 100 - 75 = 25$$

$$D_2 = (S) - 20 \text{ PSI}$$

$$D_2 = 100 - 20 \text{ PSI} = 80$$

$$Q_A = Q_1 \times \sqrt{(D_2/D_1)}$$

$$Q_A = 1114 \times \sqrt{(80/25)}$$

$$Q_A = 1992.78$$

If $Q_A \geq Q_1$, then;

$$Q_{AT} = [(Q_A - Q_1) \times .1] + Q_A$$

$$Q_{AT} = [(1993 - 1114) \times .1] + 1993 = 2080.9$$

$Q_{AT} = 2080$ G.P.M. = Total Available Water at 20 PSI Residual.

Sewer System

**Conceptual Sewer Analysis
for
Summerhawk Common Area Subdivision**

**Prepared for:
Syncon Homes
990 Ironwood Drive
Minden, Nevada 89423**

**Prepared by:
Capital Engineering
P.O. Box 3750
Carson City, Nevada 89702**

October, 2006

**Conceptual Sewer Analysis
For
Summerhawk Common Area Subdivision**

The Summerhawk Common Area Subdivision is a 201 lot residential development located in southwest Carson City, Nevada. The project is being developed by Syncon Homes and this study supports the Tentative Map for the proposed project.

The development is located near the current western terminus of Rhodes Street and the western terminus of Betts Street which are both accessed off of South Curry Street. The project is located in the foothills with the terrain sloping from west to east. The project site is currently undeveloped with significant slopes covered in field grasses that have grown subsequent to fires that have burned the site. The soils generally are rocky in nature with soil overburden that supports the grass growth.

The project acreage consists of 548 acres with development of the 201 lots occurring within 67 acres or 12% of the site. The remainder of the site will be dedicated to Carson City for Open Space, pathways, and parks.

Included herein is an aerial photo with the proposed project superimposed along with the site topography. This map provides a schematic of the project's proposed sewer collection system.

The proposed project will extend sewer along Rhodes from Curry Street and will service the northern portion of the site or approximately 159 lots. Consideration will also be given for potential development along Rhodes Street in the system analysis. The southern portion of the site, approximately 42 lots will sewer to Betts Street and will exit via two options. One will be to extend sewer east to South Curry Street and the existing system. The other option will be to turn north in a proposed street within the Sierra Development site and to connect to the Rhodes sewer extension.

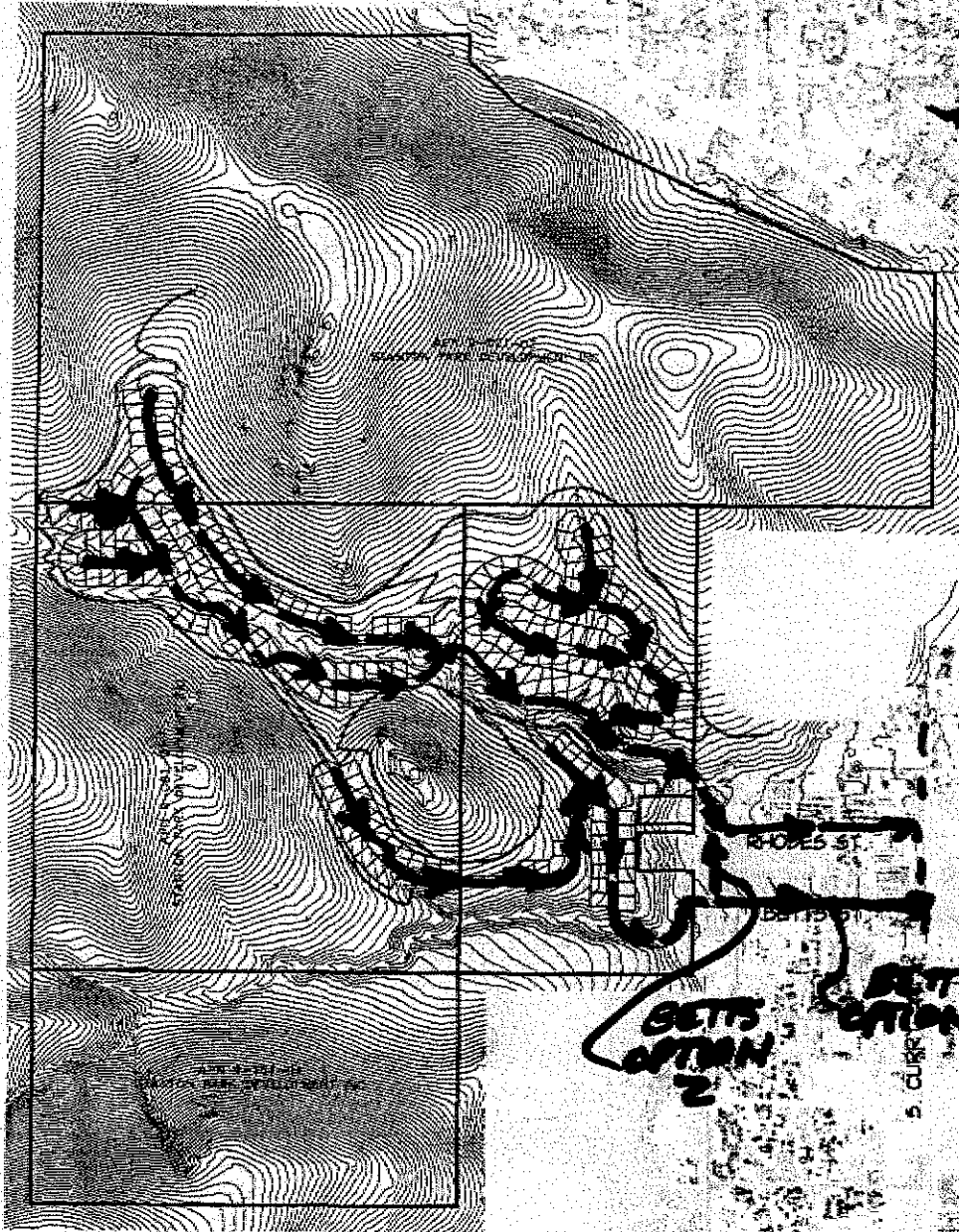
The 201 lots for the site will be the only area served through the project as the area to the west is National Forest Service property. The only off-site flow consideration will be included with the off-site sewers along Betts and Rhodes and will include potential development of the adjacent properties. However, the flows generated by the site will be between 150 to 200 gallons per day average flow per unit. Assuming a peaking factor of 3.5, the pipes will only see a peak flow of 700 gallons per day per unit maximum which equates to 0.5 gallons per minute per unit. The total peak flow is then only 100 gallons per minute from the site which leaves considerable capacity for adjacent development. Minimum 8" pipe sizes will more than adequately cover the required area needs.

Consideration will need to be given for maximum velocities for mains within the project. The street slopes in many cases are 8 to 10 percent and this will require a maximum velocity analysis at final design.

In summary, extension of 8" sewer mains from Curry Street and along Betts (or north to Rhodes as option 2) will adequately provide for extension of the Carson City sewer system to service the Summerhawk project. Maximum velocities will be a consideration in the final design of the project's sewers.

A full analysis will be provided with the final design of the project. An addition to the Carson City model will help provide a true model of system delivery at the Curry Street connection as well as help the modeling scenario associated with connecting a booster station to the Carson City system.

In summary, the Summerhawk system can be serviced by providing an expansion of the Carson City system via main extension to the site, a booster station, pressure regulating stations, and a new tank at an approximate elevation of 5200 feet..



U.S. MAP 395



PROPOSED
SUMMERHAWK
DEVELOPMENT
OCT. 2006

SEWER SCHEMATIC

To view a copy of the Summerhawk
Tentative Map
please contact the Community
Development/Planning Division
at 887-2180