

**TECHNICAL MEMORANDUM No. 3**

DATE: April 6, 2001

TO: Don McCormick, R.E.Y. Engineers

FROM: Patrick L. Stiehr *PLS*

RE: Village E1, Phases 15 & 16, Detention Basin CB, Serrano, CA

OVERVIEW

This technical memorandum (TM) provides an updated analysis for detention basin CB, identified in the Carson Creek Regional Drainage Study (CC Study) dated January 1996. The CC Study identified several detention basins within the watershed to attenuate increased runoff expected from development. Detention basin CB will be constructed as part of the improvements for Village E1, Phases 15 and 16.

The basin characteristics presented in the CC Study were conceptual but provided guidelines for attenuation expected at each of several basins. Now that design information is available, it is appropriate to update of the HEC-1 rainfall-runoff model presented in the CC Study.

This TM supplements the Drainage Report for Serrano-El Dorado Hills South Uplands Subdivision, Village E1, dated March 2001, by REY Engineers. Proposed grading is shown on the Grading Plan that is part of the report.

ANALYSIS

The proposed detention basin CB will be considerably larger than the conceptual basin described in the CC Study. The larger size allows for lower peak outflows and provides greater attenuation throughout the downstream reaches of the study area.

Table 1 provides the stage-storage-discharge relation provided by REY used to update the HEC-1 model (See page A6-1 of the CC Study for the conceptual basin characteristics). The tributary area was also updated for .105 square miles to .109 square miles based on the REY study.

Table 1 Stage-Storage-Discharge for Basin CB

Elevation (ft)	Area (sq ft)	Volume (af)	Outflow (cfs)	Comments
1150	3,200	0	0	Bottom of basin
1155	9,430	.72	20	
1160	17,800	2.29	27	
1165	27,100	4.14	31	100-year water level
1170	47,400	6.85	33	Top of bank

The CC Study indicated peak flow into the basin would be 100 cfs and the peak flow out of the basin would be 86 cfs. The updated model results indicate an inflow of about 104 cfs and an outflow of 31 cfs. The attenuation will thus be increased by about 55 cfs.

Table 2 shows the revised flows at several downstream analysis points as a result of the recent design of two detention basins. The increased attenuation provides downstream benefits of reduced flows. In the future, other detention basins identified in the CC Study may not be needed because of the relative oversizing of these two basins.

Table 2. Comparison of Flows with Detention Basins in Place

HEC-1 Analysis ID Point	Future 2 (CC Study) (cfs)	DB-CD, per TM 2, Nov 00 (cfs)	DB-CB, per TM 3, Apr 01 (cfs)
+CG	1851	1754	1700
+CR	5123	5064	5011
+TRIB4	7533	7500	7465

ID: identification, DB: detention basin

FACILITIES

Several sizes of outfall pipes were analyzed. Because of the relatively large basin, an 18-inch outfall pipe appears adequate. The capacity was estimated based on the lesser of inlet control or pipe conveyance. The pipe was assumed to be 190 feet long with upstream and downstream invert elevations of 1150± and 1143± respectively.

It is recommended that a relatively large sloping trash rack be installed to ensure the inlet will function as designed. The opening should be at least 3 feet wide, 10 feet high and a sloping face (30-degree from vertical). An equivalent structure may be appropriate but it is very important that debris does not significantly decrease the capacity of the outfall.

Velocities at the exit of the outfall pipe will be fast, on the order of 5 to 20+ feet per second, depending on discharge. It is recommended that erosion-control facilities be installed to minimize erosion. Rock riprap or an impact-type stilling basin/ energy dissipater is recommended. Details of a standard concrete impact basin are available if needed.

Please call if there are questions or if additional information is needed.

TECHNICAL MEMORANDUM No. 4

DATE: June 4, 2002

TO: Don McCormick, R. E. Y. Engineers

FROM: Patrick L. Stiehr

RE: Alternative Detention Basins within the CA Watershed per the Carson Creek Drainage Study, Development of Village F, Serrano.

OVERVIEW

This technical memorandum (TM) provides a drainage analysis for the proposed changes within the CA watershed. The CA watershed is the uppermost shed presented in the Carson Creek Regional Drainage Study (CC Study) dated January 1996. This analysis follows several similar TMs that have described and evaluated changes resulting from alternative facilities compared to the CC Study.

Typical of any large development, a variety of changes occur as development proceeds. The purpose of this TM is to demonstrate that alternative facilities will provide drainage conditions similar to those presented in the CC Study.

Recent information provided by R.E.Y. Engineers, indicate detention basin CA1 will be isolated from the drainage system. The basin, located at the west end of the golf course was designed to provide storm water detention. The basin is currently a lake that receives golf course treated water. There is a desire to keep the golf course water separate from the storm water runoff.

Village F is now being developed. A second detention basin within the Village F development area (Subshed CA2) was shown on the CC Study. The current development configuration does not include a detention basin within Subshed CA2. As a result, the first two detention basins in this area are not available. There is a road embankment farther downstream in subshed CA5 that can provide detention to replace the existing detention CA1 and the proposed CA2 detention. See Figure 1.

ANALYSIS

A preliminary grading plan of the road embankment was provided to Watermark Engineering by R.E.Y. Engineers, see Figure 2. Trial and error was used to select a 60-inch culvert under the road embankment. The stage-storage-discharge for the area upstream of the embankment is presented in Table 1.

Table 1 Stage-Storage-Discharge for Basin CB

Elevation (ft)	Area (sq ft)	Volume (af)	Outflow (cfs)	Comments
1047	.01	0	0	Approx. flowline of culvert
1050	.06	.1	58	
1055	.26	.9	235	
1060	.74	3.4	345	
1065	1.26	8.4	440	
1066	1.41	10	450	100-yr water level
1070	2	16.5	500	top of bank

The next step in the analysis was to run CC Study HEC-1 model that had been revised several times in the past to reflect the alternative drainage facilities built or currently proposed within Serrano. Table 2 provides a summary of flows at key locations based on the original model as well as recent changes.

Table 2. Summary of Flows

HEC-1 Analysis ID Point	Original CC Study (cfs)	Current Model (cfs)	Flows without DB CA1 and CA2 (cfs)	Proposed Flows with DB CA5 (cfs)
CA1-5	432	432	649	432
+CG	1,851	1,700	1,904	1,707
+CR	5,123	5,011	5,217	5,005
+TRIB4	7,533	7,465	7,620	7,477
File Name	Future2.Dat	Future3.Dat	<i>Intermediate file</i>	Future4.Dat

ID: identification, DB: detention basin

Based on the model analysis, the proposed CA5 detention basin would provide commensurate detention storage if detention basin CA1 is bypassed and detention basin CA2 is not built.

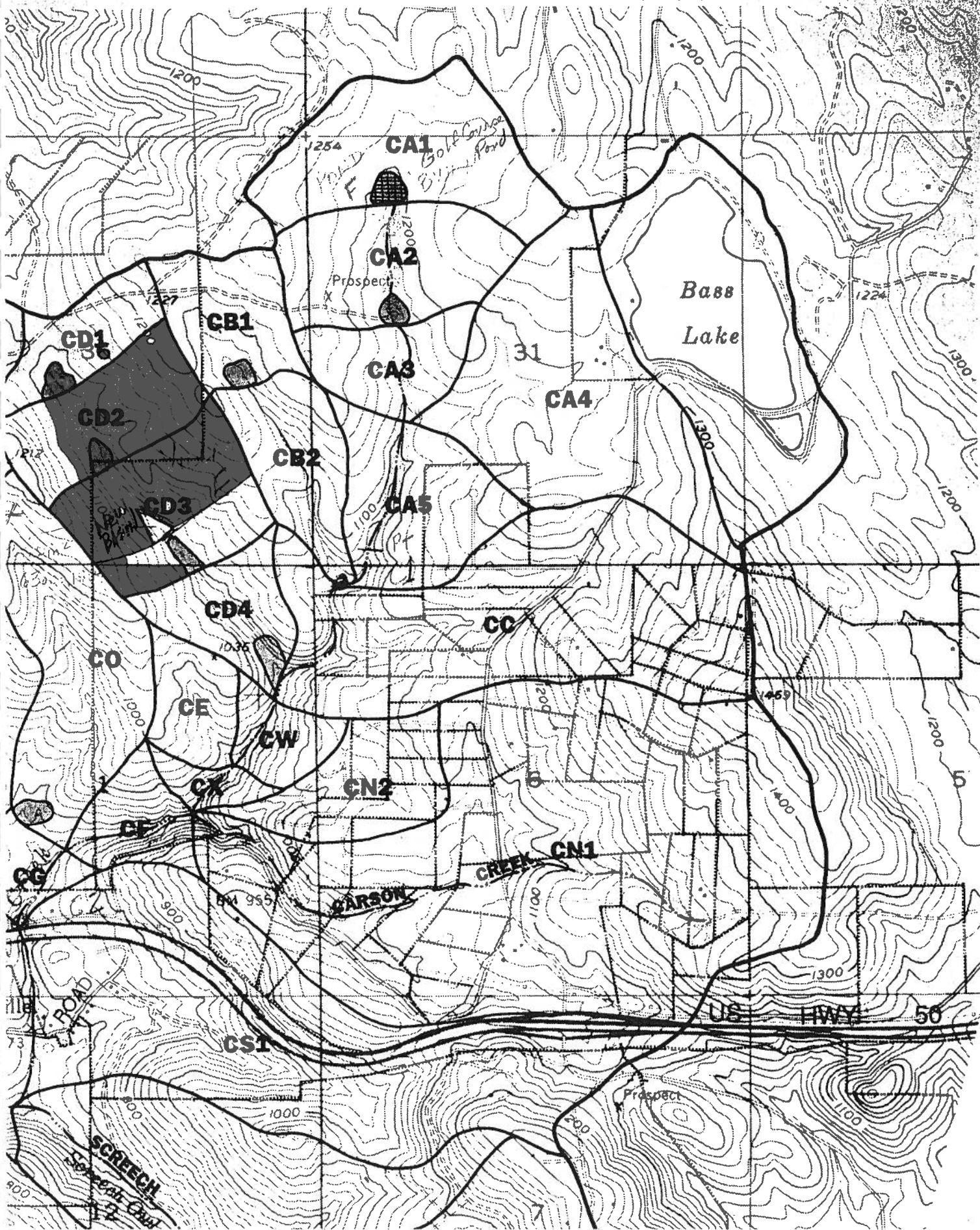
FACILITIES

The suggested outfall is a 60-nch RCB with the grooved end of the pipe at a concrete headwall. An alternative configuration would be a 30° (from vertical) sloping headwall. A 2-inch chamfer along the entire face of the sloped headwall should be part of the design and construction.

Velocities at the exit of the outfall pipe will be fast, on the order of 5 to 20+ feet per second, depending on discharge. It is recommended that erosion-control facilities be installed to minimize erosion. Rock riprap or an impact-type stilling basin/ energy dissipater is recommended. The riprap is probably sufficient. Details of a standard concrete impact basin are available if needed.

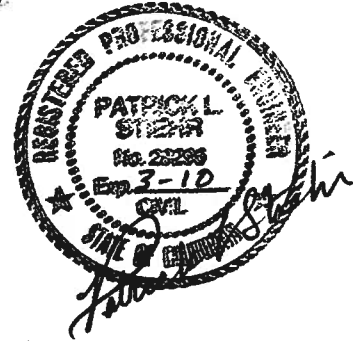
Please call if there are questions or if additional information is needed.

PORTION OF CC STUDY



Watermark Engineering, Inc.

TECHNICAL MEMORANDUM No. 5



DATE: May 12, 2008

TO: Bob Huun, R. E. Y. Engineers

FROM: Patrick L. Stiehr *PLS*

RE: Drainage Analysis to Determine Flow Changes Resulting from Diverting a Portion of the Bass Lake Watershed into Basin CA4 of the Carson Creek Watershed.

A portion of the watershed tributary to Bass Lake is proposed to be developed. There is a desire to not drain urban runoff into Bass Lake because it is used for domestic water. The alternative drainage configuration would be to redirect storm water runoff into Basin CA4, located immediately to the west. Based on preliminary improvement plans prepared by REY Engineers, an area of about 22.7 acres would become tributary to Carson Creek.

Basin CA4 was defined in the Carson Creek Regional Drainage Study, dated January 1996. This study was prepared to evaluate several proposed detention basins to mitigate increased flows as a result of development.

Typical of any large development, a variety of changes occurred as development proceeded. Specifically, the detention basin within shed CA1 was planned to be used for the golf course only and not be used to attenuate upstream urban runoff.. A second change was that the basin proposed at shed CA2 was not built.

To mitigate for these changes, a larger detention basin was proposed at shed CA5. The HEC-1 model from the original study was modified to reflect the proposed changes and the results were summarized in Tech Memo No. 4, prepared by Watermark Engineering, Inc., dated June 2, 2002. Model results indicated the detention basins would actually provide greater attenuation compared to the original layout.

The modified HEC-1 model was modified a second time to evaluate the impacts of the proposed shed increase from Bass Lake. Modeling results from the earlier revision and this revision are shown in Table 1.

Table 1. Summary of Flows

HEC-1 Analysis ID Point	Original CC Study (cfs)	Analysis Results- TM 4, dated 6/4/02		Flows with Portion of Bass Lake Shed Added (cfs)
		Flows without DB CA1 and CA2 (cfs)	Proposed Flows with DB CA5 (cfs)	
CA1-5	432	649	432	466
+CG	1,851	1,904	1,707	1,716
+CR	5,123	5,217	5,005	5,011
+TRIB4	7,533	7,620	7,477	7,484
File Name	Future2.Dat	Intermediate file	Future4.Dat	Future5.Dat

ID: identification, DB: detention basin; cfs: cubic feet per second

Results of the analysis indicate that the 22+ acres of additional area will add about 34 cfs at Analysis Point CA1-5. There is also a slight increase farther downstream but the new flows remain less than the target flows based on the original detention facilities. The impact of adding a portion of the Bass Lake shed area is very small and the existing drainage facilities continue to provide attenuation greater than those flows set forth in the original study.

Please also note that the basin within shed CA-1 was not included the 2002 analysis because the intent was to not convey the urban runoff through the golf course pond. Current information indicates the upstream watershed does pass through the golf course basin so some attenuation would be expected. However, the basin in shed CA-1 was not included in this analysis because the basin in shed CA5 attenuates flows more than the target flows set forth in the original analysis of Carson Creek.

Figure 1 is taken from the original modeling map and shows the basins in the vicinity of Bass lake. Appendix 1 is copies of the revised HEC-1 output file. Copies of the original HEC-1 file and the 2002 revisions are shown in TM # 4 and are available upon request.

Please call is there are questions or if additional information is needed.

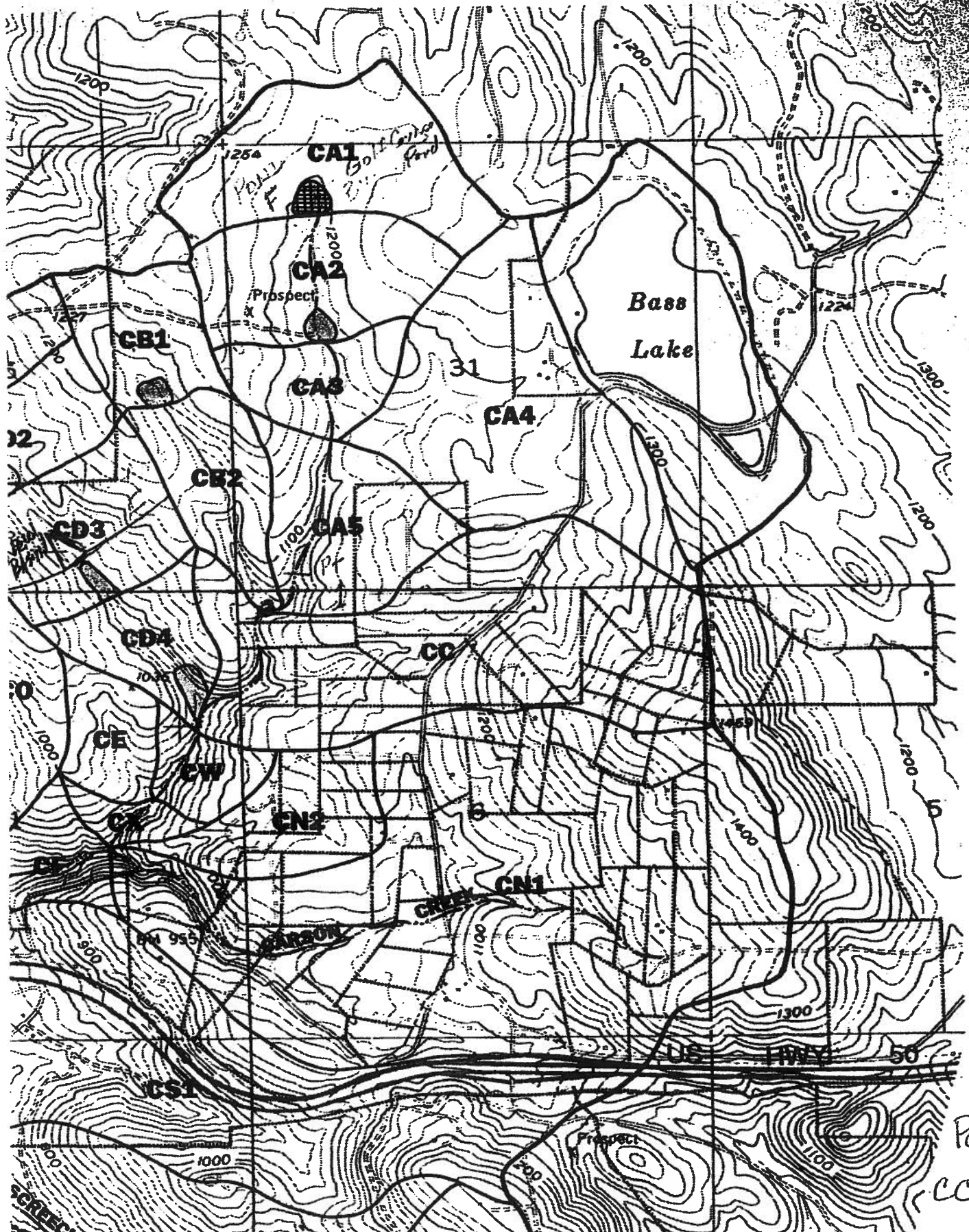


FIG 1
 PORTION
 OF
 CC STUDY