VII. Drainage Analysis

A. Storm Water Model

Performing a drainage analysis provides the basis for implementing and locating adequate storm drainage structures and components within the project area. As part of the drainage analysis effort, the peak discharge was calculated at key locations to properly size the stormwater management system. The drainage analysis approach is consistent with the MOA PM&E Design Criteria Manual (DCM) and the Drainage Design Guidelines. Supporting data and modeling for the drainage analysis is found in APPENDIX E.

The drainage basin and subbasins were initially based on MOA GIS subbasin data and then further refined and adjusted using MOA GIS 4-foot contour data. The computer software ArcMap by ESRI was used to view GIS data in conjunction with AutoCAD topobase mapping to determine impervious areas, slope and land cover. Once the basin data was compiled from ArcMap and AutoCAD, Microsoft Excel was used to compute the necessary input parameters required for both the existing and proposed CivilStorm drainage models.

A total of 14 contributing drainage subbasins have been identified and analyzed for runoff response. The storm water runoff generated from each subbasin is presented below in TABLE 10 (see APPENDIX E for subbasin locations). For modeling and analysis purposes, undeveloped areas, not scheduled to be developed as part of this project, were considered to remain undeveloped as these areas are BLM and park lands.

Table 10 – Summary of Campbell Airstrip Drainage Model Peak Runoff Flows

SubBasin ID	Area (Acre)	10-yr 24-hr		2-yr 24-hr	
		(cfs)	(cfs/AC)	(cfs)	(cfs/AC)
Campbell Airstrip Road					
1	3.4	**0.11**	*0.03*	**0.08**	*0.02*
2	3.5	**0.12**	*0.03*	**0.08**	*0.02*
3	2.1	**0.07**	*0.03*	**0.05**	*0.02*
4	2.9	**0.10**	*0.03*	**0.07**	*0.02*
5	3.0	**0.10**	*0.03*	**0.07**	*0.02*
6	10.1	**0.34**	*0.03*	**0.24**	*0.02*
7	7.5	**0.25**	*0.03*	**0.18**	*0.02*
8	0.3	**0.11**	*0.36*	**0.08**	*0.26*
9	0.3	**0.11**	*0.32*	**0.08**	*0.23*
10	0.7	**0.25**	*0.33*	**0.18**	*0.24*
11	0.7	**0.25**	*0.37*	**0.18**	*0.27*
12	0.5	**0.18**	*0.35*	**0.13**	*0.25*
13	0.5	**0.18**	*0.35*	**0.13**	*0.25*
14	0.2	**0.07**	*0.36*	**0.05**	*0.26*

B. Proposed Drainage System

The results of the preliminary drainage analysis indicate minor to non-existent runoff from the surrounding hillside. Storm runoff is absorbed into the natural vegetated forest before reaching the roadway. The proposed roadway improvements should include ditches on the uphill (east) side to catch storm runoff that is not absorbed before reaching the roadway corridor and to provide channelization and treatment for roadway surface runoff. Cross culverts would be constructed where necessary.

The downhill (west) side of Campbell Airstrip Road is a fill condition, allowing roadway runoff to sheet flow over, and be absorbed by, the natural forested vegetation. When the multi-use trail parallels the roadway on the west side, a ditch or swale would be constructed between the multi-use trail and the roadway with cross culverts as necessary. Culvert outlet should be constructed to convert the outfall into a sheet flow before it can channel across the natural vegetation.

The separated multi-use trail should be constructed above the existing ground where feasible, creating a fill condition on the uphill (east) side of the multi-use trail. This creates a natural barrier and ditch running along the east side of the multi-use trail. When the multi-use trail cannot be constructed above the existing ground, a ditch should be installed on the uphill side. Cross culverts should be installed as necessary with outlet treatment to convert the outfall into a sheet flow.

Stormwater treatment facilities should be incorporated into the design to minimize potential water quality impacts to the North Fork of Little Campbell Creek. Design of treatment facilities are based on the requirements of MOA and ADEC. MOA requires a project to treat the initial 0.5 inches of post-development runoff from a 2-year, 24-hour storm event. Overland discharge through a vegetation-lined channel, or bio-swale, is considered as the first option for stormwater treatment. Biofiltration is a natural method to treat water runoff quality. A biofiltration swale must be a minimum of 2 feet wide and be of sufficient length to provide the necessary hydraulic residence time at the design velocity. The maximum design velocity is 0.9 feet per second with an optimal residence time of 9 minutes. Longitudinal slopes should be 2 to 4 percent and the swale side slopes should not exceed 1 vertical to 3 horizontal. Biofiltration swales can be constructed for the required lengths up-stream of the cross culverts to reduce impacts to uphill side slopes while still meeting water quality treatment requirements.

VIII. Right-of-Way Impacts

Mile 0.3 to 0.7 crosses MOA HLB land through a 40-foot wide easement defined by the location of the existing roadway. Since this road easement is not adequate for the improvements and does not meet current right-of-way standards (minimum 50 to 60-foot width) a new right-of-way will need to be dedicated.

IX. Design Recommendations

A. Roadway

The plan and profile drawings for the proposed roadway improvements can be found in <u>APPENDIX B</u>.

The proposed cross section is a 32-foot wide, paved, two-lane roadway consisting of two 11-foot wide travel lanes and two 5-foot asphalt shoulders with painted centerline and shoulder striping.

Horizontal alignment generally follows the existing roadway centerline. Vertical roadway profile is generally slightly above the existing grade to allow drainage to sheet flow off the roadway to the west without the need for a ditch.