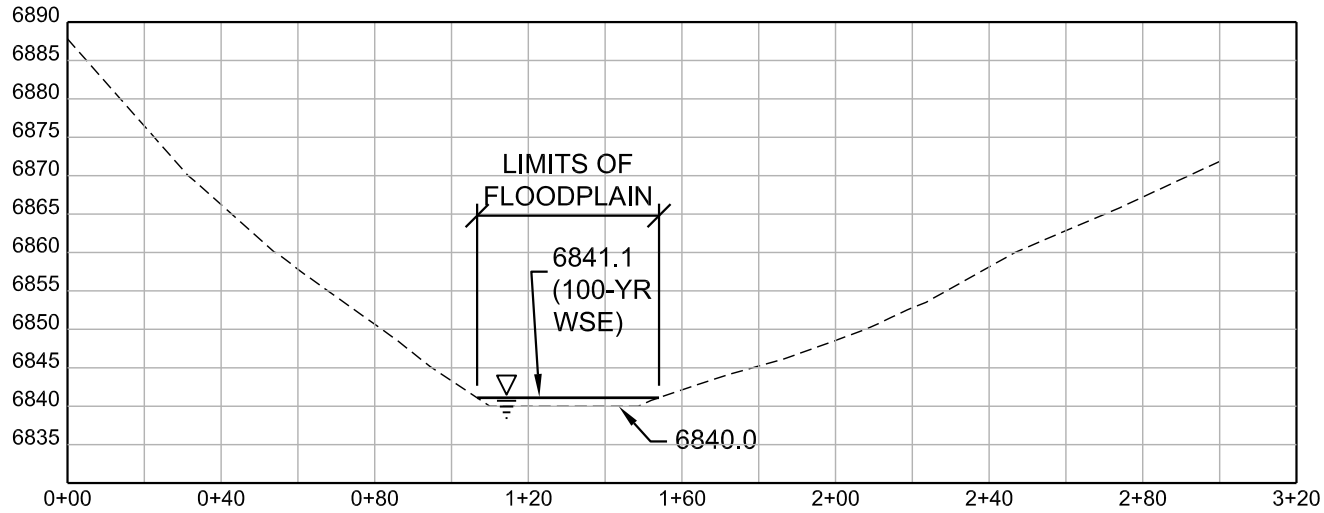

SECTION A-A

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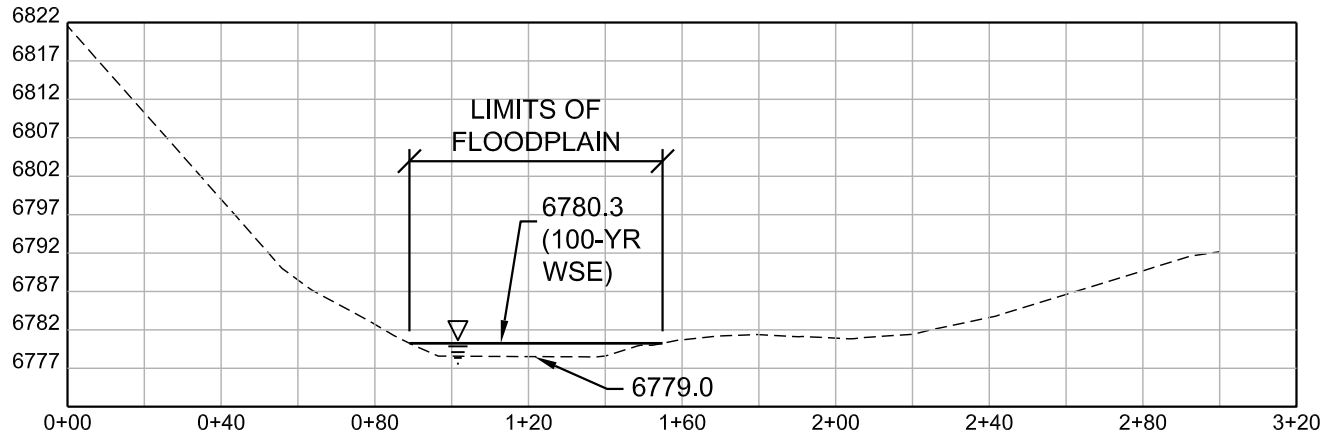

SECTION B-B

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Vert. 1"=25'

GRAPHIC SCALE

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1 INCH = 50 FEET

FIGURE 1.10
FLOODPLAIN SECTION
Northstar NMMP Project
Trimont Land Company

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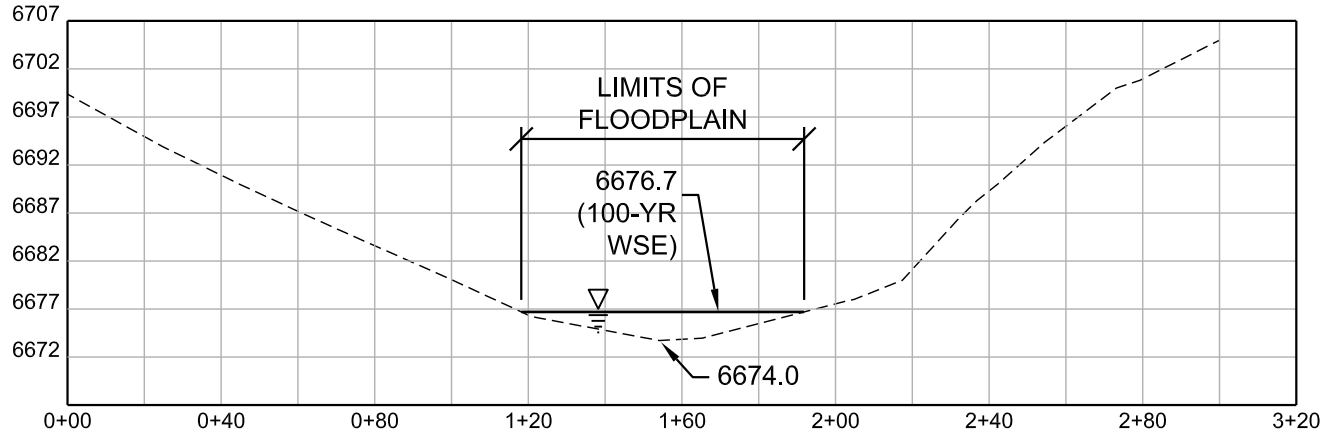

SECTION C-C

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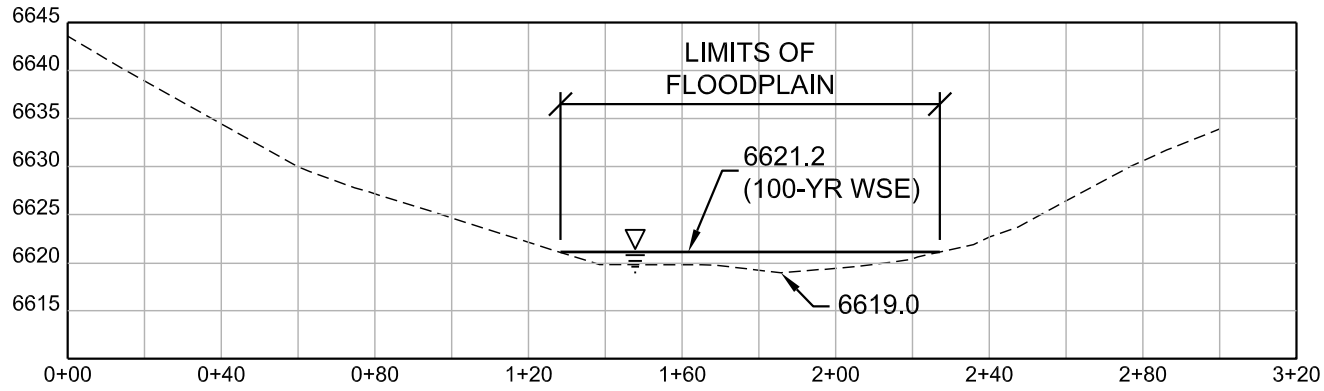

SECTION D-D

Scale: Horz. 1"=50'
Vert. 1"=20'

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1 INCH = 50 FEET

FIGURE 1.11
FLOODPLAIN SECTION
Northstar NMMP Project
Trimont Land Company

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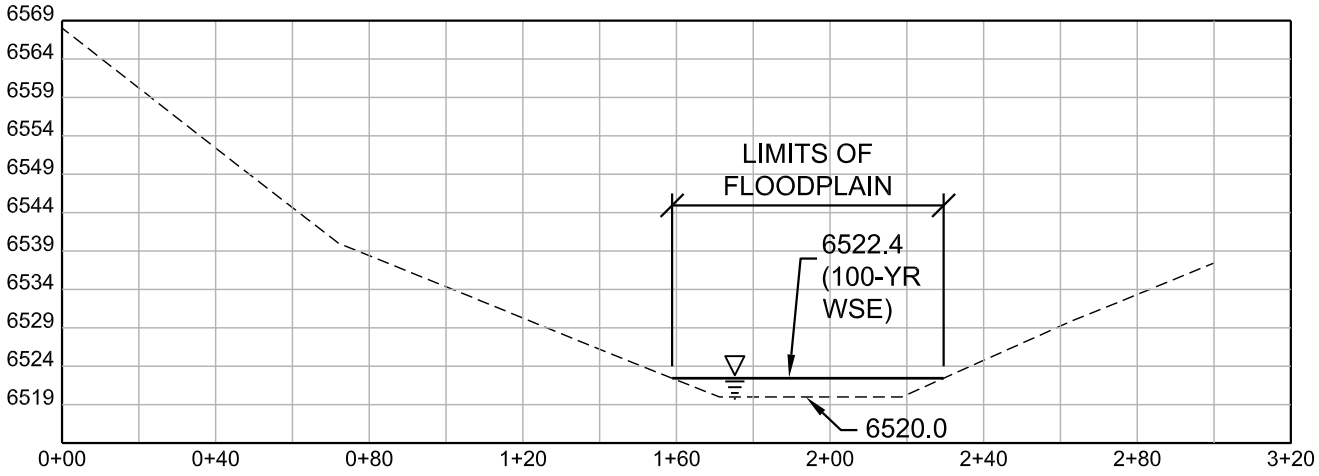

SECTION E-E

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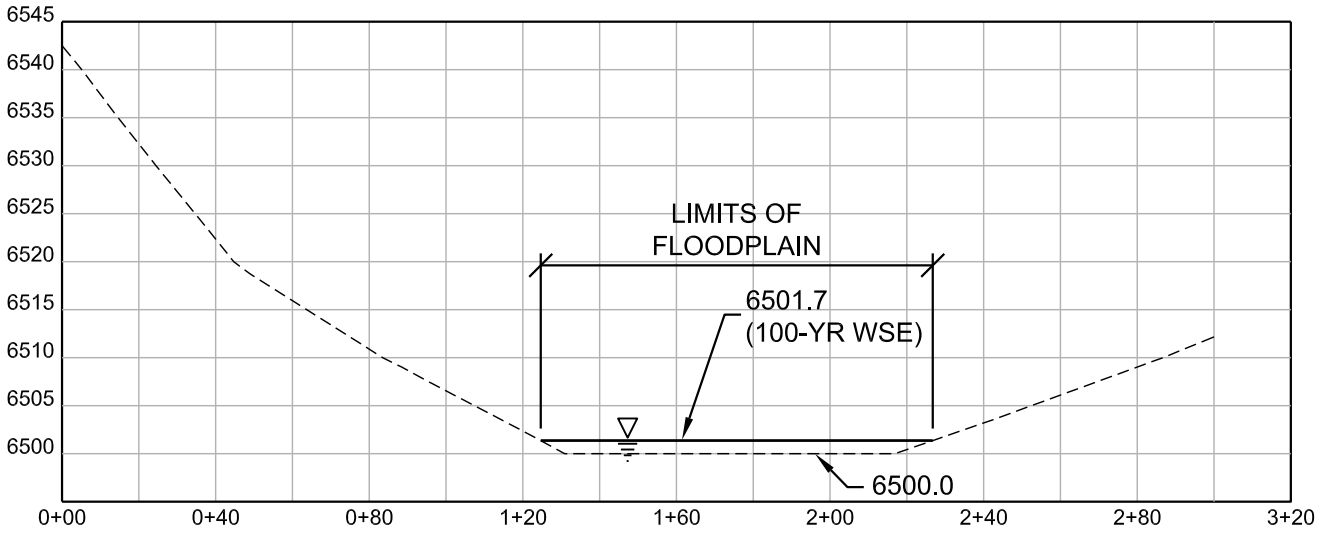

SECTION F-F

Scale: Horz. 1"=50'
Vert. 1"=20'

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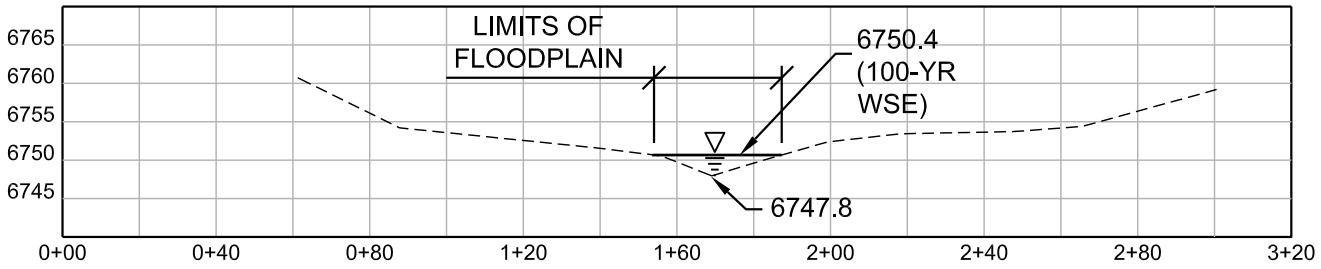
1 INCH = 50 FEET

FIGURE 1.12
FLOODPLAIN SECTION
Northstar NMMP Project
Trimont Land Company

AUERBACH ENGINEERING CORPORATION

J:\1111.05F\dwg\Exhibits\DrainageAnalysis_V_W_Lifts\Fig_1.9-1.12.dwg



SECTION G-G

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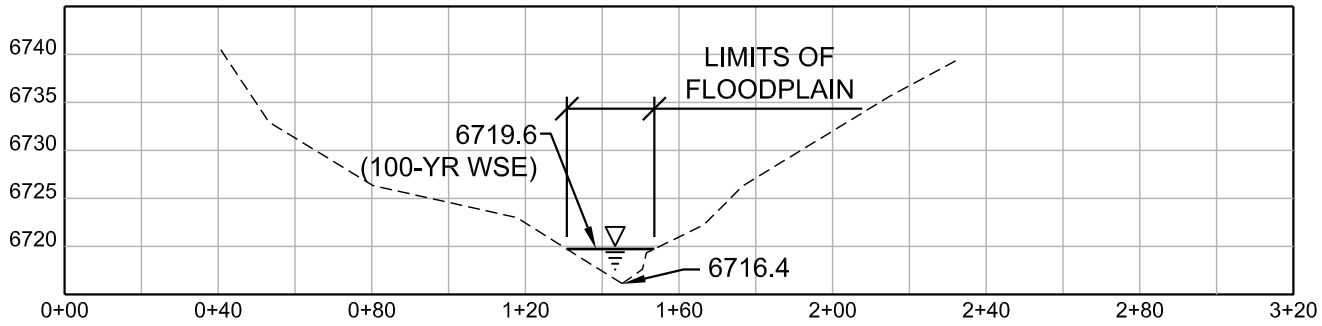

SECTION H-H

Scale: Horz. 1"=50'
Vert. 1"=20'

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1 INCH = 50 FEET

FIGURE 1.13
FLOODPLAIN SECTION
Northstar NMMP Project
Trimont Land Company

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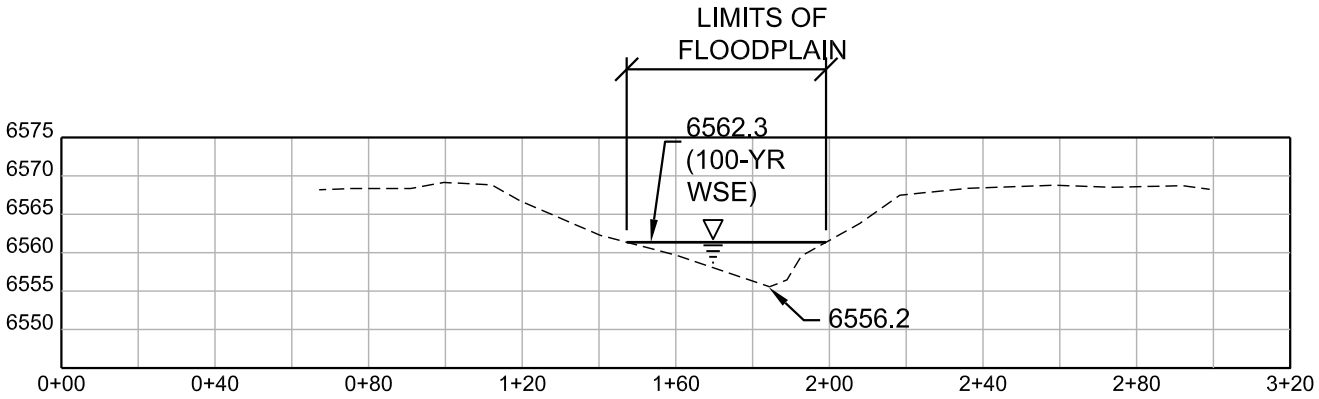

SECTION I-I

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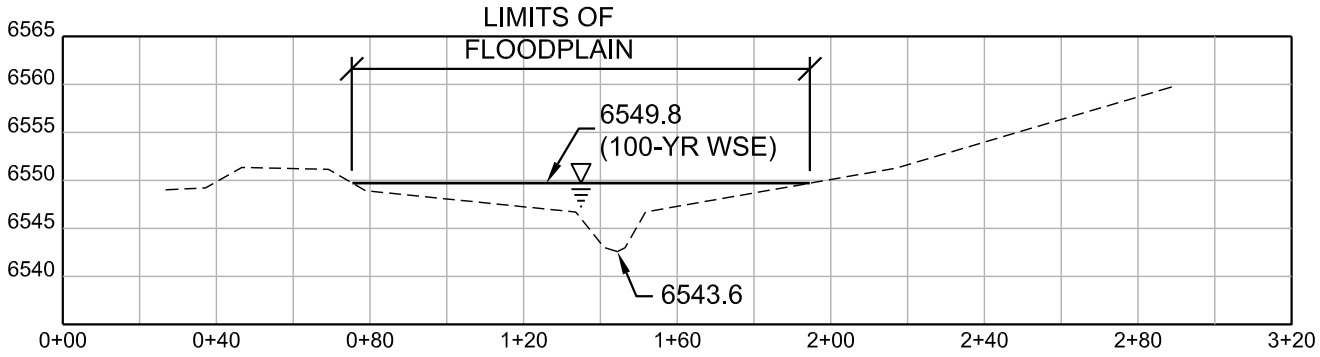

SECTION J-J

Scale: Horz. 1"=50'
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GRAPHIC SCALE
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1 INCH = 50 FEET

FIGURE 1.14
FLOODPLAIN SECTION
Northstar NMMP Project
Trimont Land Company

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APPENDIX

Table 1.4	**100-YR FLOW COMPARISON** POST PROJECT Northstar NMMP Project Trimont Land Company		
Watershed No. 1			
	HEC-1 NO SNOW	**HEC-1 WITH SNOW**	**SQUAW CREEK**
Confluence Point	100-yr Peak (cfs)	100-yr Peak (cfs)	100-yr Peak (cfs)
C1.1	472	606	458
C1.2	714	928	715
C1.3	826	1070	843
C1.4	973	1271	1025
C1.5	1483	2076	1864
C1.7	1568	2139	1942
Watershed No. 2			
Confluence Point	100-yr Peak (cfs)	100-yr Peak (cfs)	100-yr Peak (cfs)
C2.1	320	424	308
C2.2	806	1067	599
Watershed No. 3			
Confluence Point	100-yr Peak (cfs)	100-yr Peak (cfs)	100-yr Peak (cfs)
C3.1	565	748	655
C3.2	950	1257	1125
C3.3	1090	1443	1326

Notes:
cfs = cubic feet per second
yr = year

AUERBACH ENGINEERING CORPORATION

CIVIL ENGINEERING • LAND SURVEYING • ENVIRONMENTAL PLANNING
PROGRAM MANAGEMENT AND PLANNING

Proj. #: 1111.05N

MEMORANDUM

To: Jerusha Hall, Northstar California Resort

From: Brian Clark, P.E. / Walter Auerbach P.E.

Date: September 25, 2013

Re: Northstar Mountain Master Plan – Drainage Influence on Aspen Grove Condominiums

1.0 Introduction

The purpose of this memorandum is to supplement the Northstar California, Northstar Mountain Master Plan (NMMP) Draft Preliminary Drainage Report, revised April 2013, prepared by Auerbach Engineering Corporation (AEC). Specifically, this supplement addresses the potential for increases in storm water runoff to the areas upslope of the Aspen Grove condominiums. The specific confluence points under study include the detention basin and bioswale located directly upslope of the southern boundary of Aspen Grove, and the West Fork of West Martis Creek at the point where it crosses into Aspen Grove property.

2.0 Existing Drainage Description

As shown on Figure 1.1, Northstar California Resort is divided into three (3) main watersheds, with each watershed divided into smaller drainage basins. The watersheds are primarily defined by the prominent ridgelines, while smaller ridges, natural landforms and man-made improvements define the drainage basins. As shown on Figure 1.2, Aspen Grove is located on the southern end of Drainage Basin Area 1-L, which is located within the northern and lower elevation portion of Watershed 1.

Historically, the hydrology of the Aspen Grove condominiums was influenced partially by Drainage Basins 1-G (the Village), to the south, 1-F, to the southwest, and 1-M (Village North Condos), to the west. However, in 2004 and 2008 substantial storm water improvements were installed to route runoff from Basins 1-G and 1-F through water treatment systems, including the retention pond, bioswale and infiltration gallery, which subsequently discharge to the West Fork of West Martis Creek upstream of Aspen Grove.

The 2004 improvements are described within the Drainage Study for Northstar Village, dated April, 2004 by Psomas. Some of these improvements are shown schematically on Figure 1.3, and include a 42" and 48" storm drain (42"/48") that collects the majority of runoff from the upslope portion of Basin 1-F; improvements to the Village storm water collection system (Village System), and a retention pond and

bioswale for low flow water quality treatment of the impervious surfaces built within the Village improvement projects.

In 2008, additional improvements were made to the Village drainage system. These are fully described by the Drainage Report, Village at Northstar, Overall Development Area, dated February 2008 by SCO. Also shown within Figure 1.3, these improvements, as we understand them, included the following:

1) A low-flow outlet for the retention pond to allow the pond to drain within 12 hours (changing the definition of the pond to detention as opposed to retention). Outlet drains directly to the West Fork of West Martis Creek.
2) 5-foot deep subdrain trench along the northern edge of the existing bioswale to intercept and route infiltrated water to the West Fork of West Martis Creek.
3) A new infiltration gallery for additional retention capacity.
4) Remove continuity of 42”/48” from the detention pond and the rerouting of low flows from the upslope portion of Drainage Basin 1-F away from the detention pond and to the new infiltration gallery. Overflow from the infiltration gallery drains to the bioswale.

The combined improvements of the 2004 and 2008 projects successfully route the majority of storm water flows (97%) from Drainage Basin 1-F through the 42”/48” storm drain directly to the West Fork of West Martis Creek at confluence point C1.4; there appears to be no continuity of the 42”/48” with the detention basin – historically, low flows from the 42”/48” were routed to the detention pond via a 12” line. The 12” line was abandoned in 2008. Additionally, a small percentage of flows (approximately 8 cfs) from the 42”/48” storm drain is routed to the infiltration gallery, which overflows to the bioswale and ultimately into the West Fork of West Martis Creek. The only remaining flows to the detention basin are runoff from the Village and a small portion of runoff from the Village North Condos (the remaining 3% from Drainage Basin 1-F) which is not within the area of improvements proposed by the NMMP.

3.0 Proposed Project Drainage

3.1 Retention Basin and Bioswale

Some of the proposed improvements included in the NMMP occur within Drainage Basin 1-F. As shown on Figure 1.4, this basin is 178 acres, and primarily composed of forest, several dirt roads, paved roads, a portion of Highlands Phase III, Village North Condos and a majority of the Ritz Carlton Hotel.

Storm water flows originating upslope of the hotel property are currently collected in infiltration trenches and detention ponds, and peak flows are released as overland flows through the forest below. Rainfall and snow melt originating below the hotel is either infiltrated into the forest floor or traverses as overland flow and is captured in drainage swales, which culminate at Northstar Drive where runoff enters the 42”/48” storm drain system as described above. Runoff from the portion of Village North

Condos within Drainage Basin 1-F also enters the Village drainage system. No change in storm water runoff will occur within the Village North Condos due to the projects proposed within the NMMP.
The improvements proposed within Drainage Basin 1-F include:

- 21.4 acres of ski trails
- 0.2 acres of ski lift (terminals, towers)

The remainder of Drainage Basin 1-F includes:

- 66.6 acres of woods/forest
- 49.0 acres of existing ski trails
- 37.2 acres of residential/landscaped areas
- 3.6 acres of paved roads and parking lots

Existing and unmitigated proposed storm water flows within Drainage Basin 1-F are listed in Table 1 below. See Section 4.0 Mitigation.

Table 1. Drainage Basin 1-F

Existing				
2-yr Peak (cfs)	5-yr Peak (cfs)	10-yr Peak (cfs)	25-yr Peak (cfs)	100-yr Peak (cfs)
24	37	50	76	110
Future (Unmitigated)				
2-yr Peak (cfs)	5-yr Peak (cfs)	10-yr Peak (cfs)	25-yr Peak (cfs)	100-yr Peak (cfs)
24	38	53	79	112
Flow Increase (Unmitigated)				
2-yr (cfs)	5-yr (cfs)	10-yr (cfs)	25-yr (cfs)	100-yr (cfs)
0	1	3	3	2
% Increase (Unmitigated)				
2-yr (%)	5-yr (%)	10-yr (%)	25-yr (%)	100-yr (%)
0.0	2.7	6.0	3.9	1.8

Notes:
cfs = cubic feet per second
yr = year

As detailed within SCO's Drainage Report, the existing 42"/48" storm drainage system has peak flow capacity of 259.5 cfs.

As indicated previously, part of the 2008 storm water drainage improvements was the installation of the subdrain trench below the bioswale to capture any subsurface drainage that infiltrated to the soil from

the bioswale and infiltration system. Again, the infiltration system and bioswale only receives low flow run off from Drainage Basin 1-F, approximately 8 cfs. The remainder is routed directly to the West Fork of West Martis Creek. The subdrain trench captures and routes subsurface drainage directly to the West Fork of West Martis Creek. Assuming these existing features operate as designed, and as we understand them, NMMP post-project flows (mitigated or unmitigated) would be equal to pre-project flows at the Aspen Grove properties as all flows above 8 cfs discharge directly to the West Fork of West Martis Creek and infiltrated run off is captured by the subdrain trench and discharged to the West Fork of the West Martis Creek.

3.2 West Fork of West Martis Creek Floodplain

All drainage basins within Watershed 1 (Drainage Basins 1-A through 1-N) contribute to the flows within the West Fork of West Martis Creek and/or West Martis Creek via overland flows, swales, culverts, storm drain systems and roadside drainage ditches.

As described within the Draft Preliminary Drainage Report, unmitigated storm water runoff from Watershed 1 as a result of the proposed NMMP projects (see Figure 1.5 for proposed projects), will increase by 1.6% to 675 cfs for the 10-year event and by 1.0% to 1,568 cfs for the 100-year event at confluence point C1.7, located upstream of Northstar Drive. (Confluence point C1.4, adjacent to Aspen Grove, will see an unmitigated maximum increase of 16.0%)

Placer County utilizes comparative flows from the Squaw Creek drainage area for proofing hydrologic models for projects of similar terrain and elevations. Squaw Creek flow rates equal 133 cfs/square mile for the 10-year event and 493 cfs/square mile for the 100-year event. These flows rates give total flows from Watershed 1 of 512 cfs for the 10-year event and 1,898 cfs for the 100 year event. This provides a conservative 330 cfs buffer for the 100-year event in respect to analytical and/or design efforts.

Floodplain analysis conducted by Civil Solutions in 2001 (Preliminary Project Hydrology Report for the Village at Northstar, An Analysis of: The West Fork of Martis Creek (upstream of Northstar Drive)), utilized the Squaw Creek flow rates to map the 10-year and 100-year floodplains of the West Fork of West Martis Creek adjacent to Northstar Village, including the Aspen Grove area. This analysis showed that 1,898 cfs will stay within the banks of the West Fork of West Martis Creek at the areas of the Village and the Aspen Grove condominiums, as shown on Figure 1.3.

4.0 Mitigation

There are two proposed options for potential mitigation of post-project flow increase which will decrease flows to, or below, pre-project flows:

1. A soil management and revegetation program to the proposed ski runs which would provide over 75% vegetative cover thus increasing the infiltration rate, which would decrease storm water flows.
2. Construction of retention/detention facilities that store and infiltrate the additional storm water runoff.

4.1 Soil and Vegetation Management

An intensive soil management program occurring concurrently and directly after construction of the proposed ski trails would promote infiltration, slow runoff velocities and protect slopes from erosion. The revegetation program would be designed with a goal of establishing vegetative coverage of over 75%. The existing ski trails have vegetative coverage of approximately 50-75%. The Placer County Flood Control and Water Conservation District's Stormwater Management Manual (SWMM), Table 5-3, Constant Infiltration Rates for Hydrologic Soil-Cover Complexes, provides infiltration rates for use in the hydrologic computer software HEC-1 (USACE). These infiltration rates are based on soil group (A-D), vegetative cover type (woods, grasses, developed, etc.) and quality of cover (poor, fair, and good). According to Table 5-3 of SWMM, an increase of vegetative cover from 50-75% to over 75% would provide an increase of storm water infiltration rate from 0.16 inches/hour to 0.22 inches/ hour. Comparative results from the HEC-1 model, shown in Table 2. below, indicates that a vegetative coverage of greater than 75% on the proposed ski trails would mitigate the storm water runoff from all proposed improvements within Drainage Basin 1-F.

Table 2. Drainage Basin 1-F with Soils and Vegetation Management

Existing				
2-yr Peak (cfs)	5-yr Peak (cfs)	10-yr Peak (cfs)	25-yr Peak (cfs)	100-yr Peak (cfs)
24	37	50	76	110
Future (Mitigated)				
2-yr Peak (cfs)	5-yr Peak (cfs)	10-yr Peak (cfs)	25-yr Peak (cfs)	100-yr Peak (cfs)
24	37	50	76	110
Flow Increase (Mitigated)				
2-yr (cfs)	5-yr (cfs)	10-yr (cfs)	25-yr (cfs)	100-yr (cfs)
0	0	0	0	0

Notes:
cfs = cubic feet per second
yr = year

4.2 Retention/Detention Facilities

An alternative to mitigation through soils and vegetation management would be construction of retention/detention facilities. The largest increase occurs with the 10-year storm event with a 3 cfs (6%) increase. The associated run off volume is 3,600 ft^3. Infiltration of this additional volume would be achieved by:

- Infiltration trenches at and around the ski lift towers and ski lift terminal. There are 19 ski lift towers within drainage basin 1-F. Each tower would have an infiltration trench with a volume capacity of 7.5 ft^3 each for a total of 143 ft^3. The ski lift terminal will have an infiltration trench with a volume capacity of 650 ft^3. Total "hard" improvement infiltration equals 793 ft^3. See the attached Detail 1, Infiltration Trench Detail.
- Micro-retention ponds, built as waterbars with no outlets, constructed along contours to provide, at a minimum, 1 ft^3 of storage per linear foot of waterbar. Drainage basin 1-F will require approximately 40 waterbars, 70-ft in length, to retain/detain the remaining 2,807 ft^3 of storm water runoff. See the attached Detail 2, Standard Waterbar Detail.

5.0 Conclusion

This memo details the results of an intensive hydrologic analysis that included:

1. Review of all pertinent past drainage reports for Northstar improvement projects.
2. Mapping of existing topography, drainage basins and drainage routes.
3. Calculation of existing drainage conditions throughout the project area.
4. Calculation of proposed drainage conditions in throughout the project area.
5. Complex computational modeling and review of results.

We conclude the following:

1. Existing drainage improvements within the Northstar Village area, if operating per their original design, route storm water runoff greater than 8 cfs from NMMP proposed improvement areas within Drainage Basin 1-F directly to the West Fork of West Martis Creek.
2. A previously existing 12" storm drain that did provide continuity between the NMMP portion of Drainage Basin 1-F and the detention pond was abandoned in 2008. Therefore, there appears to be no continuity between Drainage Basin 1-F and the existing detention pond.
3. NMMP post-project peak flows for the 2, 5, 10, 25 and 100-year return interval within Drainage Basin 1-F has a maximum unmitigated increase of 6% which occurs during the 10-year storm event.
4. This increase of storm water runoff would be reduced through mitigation as described, which slow and infiltrate storm water runoff, to levels equal to or less than pre-project conditions, and

would have no impact to the hydrology of Drainage Basin 1-F and Watershed 1 as a whole and would thus have no impact to the hydrology of Drainage Basin 1-L or the Aspen Grove condominiums.

At the time of final design for the NMMP improvements a detailed Drainage Report will be prepared providing necessary specifics, details and engineering calculations addressing all requirements, set forth by the Placer County Stormwater Management Manual and other conditions as required by Placer County, necessary to reduce post-project flows to levels equal to or less than pre-project levels.