Engineering Review Comments

On the

BLUE INDIAN SUBDIVISION

WEI Review Comments
(By Gerald R. Williams, P.E.)

Original review comments below in black text are dated September 27, 2012, and pertain to the plat dated February 22 and March 2, 2012, plans dated June 29, 2012, Masterplan dated December 1, 2009, and the Drainage Report dated November 11, 2009.

C-500-2 **Road Section** The roads need to provide an all weather surface for fire trucks and other service vehicles. Please provide the Geotechnical Report or calculations that show structural adequacy of the road section for HS-20 loading, or note that County standards are being followed.

C-501-1 **Fire Hydrant Supply Line** Show, using barometric pressure (atmospheric minus potential barometric drop) minus the vapor pressure, that there will be sufficient pressure at the hydrant nozzle elevation to meet the fire district's pressure needed to push the required fire district flow rate through their suction hose to their truck. That is, if they need X psi at the nozzle to get Y flow through their suction line to the truck, will the 8" line shown provide sufficient capacity given barometric pressures and elevation differences? Assume the pond water level is at the bottom of the storage fire flow storage volume.

September 25, 2012

Curt Moore
Teton County Planning
150 Courthouse Drive
Driggs, Idaho 83422

RE: Blue Indian Phase 2 Engineering Review Comments

Dear Mr. Moore:

This letter includes response to comments included in a memo dated September 10, 2012 from Williams Engineering, Inc. (WEI) which was forwarded to us via email on September 19, 2012. The memo includes engineering review comments pertaining to the Blue Indian Subdivision Phase 2 Plat dated February 22 and March 2, 2012; plans dated June 29, 2012; Masterplan dated December 1, 2009 and the Phase 1 Drainage Report dated November 11, 2009.

The majority of the comments refer to the Phase 1 Drainage Report which was approved with the Phase 1 final plat and Master Plan by the Teton County Board of County Commissioners on November 12, 2009. The WEI review did not include the Phase 2 Drainage Report dated June 21, 2012 and some of the review comments are addressed in this later report as stated below. The Phase 2 report was sent via email to WEI on September 19, 2012.

DR-1 Offsite Considerations – Discussion of offsite drainage is included in the Phase 2 report, page 7 and Appendix A page 14-16 and Appendix B page 3, 50-54.

DR-2 Thundershower Runoff – The NRCS Curve Number method was developed from 20 years of studies of the rainfall-runoff relationship for small rural watersheds. It is a recommended method for estimating direct runoff in guidelines published by the Idaho Transportation Department "Drainage Design Manual" (Section 620.00), the "Catalog of Stormwater Best Management Practices for Idaho Cities and Counties" (Appendix D) and is commonly used by jurisdictions throughout the west including Teton County Wyoming (Teton County Wyoming LDR Section 4920 B.1). This method and the associated CNs that were used in the Phase 1 and Phase 2 Drainage Reports are taken from tables published by the NRCS (1986) and I am not comfortable arbitrarily increasing the CNs based on an opinion that is not a "national standard" with no supporting data.

DR-3 Rainfall on snowmelt on frozen ground runoffs – The extent of the requirements for drainage design from Teton County Code, 9-4-2-B-6 is as follows:

> *Drainage: Each subdivision and PUD shall provide a storm water drainage system, together with a stamped certification from a professional engineer that the proposed storm water drainage is adequate to retain or detain anticipated peak storm water on site and/or convey it off-site in compliance with state and local law requirements regarding the protection of downstream property owners, and in a manner to prevent soil erosion and sedimentation both on and off-site. (amd. 11-14-08)*

DRAFT

And from the "Highway and Street Guidelines for Design and Construction" published November, 2001 and adopted by the Teton County Idaho BOCC April 25, 2005,

> *The [drainage] design shall be based on the Idaho Transportation Department's publication, Urban Storm Sewer Design for Idaho Highways, latest edition, or procedures as set forth by the LHJ. The design storm return period shall be at least ten (10) years.*

The stormwater management system for Blue Indian was designed to enhance water quality from nuisance flows (first 1" of runoff or the 2-year event), convey runoff from minor storm events (10-year recurrence interval) via swales and culverts, and convey runoff from major storm events (100-year recurrence interval) without causing more than 1-ft of flow depth over the roads to allow for emergency vehicle access. The developed peak and volume of runoff from the 100 year event is less than historic conditions. This is above and beyond the current Teton County drainage design requirements and is consistent with requirements in other jurisdictions.

However, we did investigate the rainfall on snowmelt and frozen ground conditions in order to assure that the current design is adequate in this condition as well. Guidelines from the "Catalog of Stormwater Best Management Practices for Idaho Cities and Counties" were used. Curve Numbers were adjusted to reflect an antecedent moisture condition of III and the depth of precipitation was increased to account for snowmelt using the Degree-Day Method. These adjustments account for a conservative condition of the highest intensity storm occurring during a sudden thaw of 40 degrees. Infiltration from the ponds was excluded from the outflow and road overtopping was added using a broad crested weir model. The input and output is summarized in the following tables.

Table 1 – Runoff Curve Numbers

Description of Land Use	CN (Hydrologic Soil Group B, AMC II)	CN (AMC III)
Meadow (grass, no grazing, mowed for hay)	58	76
Gravel Roads	85	94
Paved parking lots, roofs, driveways	98	99

Table 2 – Design Storm Data

Recurrence Interval	Storm Type	24-hr Precipitation	24-hr Precipitation w/ snowmelt
100-yr	Type II	2.53 inches	3.09 inches
10-yr	Type II	1.6 inches	2.16 inches

DRAFT

Table 3 – Drainage Summary Table Historic

HISTORIC CONDITIONS				
Design Pnt	**Trib. Basin(s)**	**Trib. Area (ac)**	**Peak Q_{100} (cfs)**	**V_{100} (ac-ft)**
DP1	Ex 1	88.9	39.2	8.0
DP2	Ex 2	27.5	13.4	2.5
DP3	Ex 3	10.5	6.2	0.9
DP4	EX 4	15.7	9.3	1.4

Table 4 – Drainage Summary Table, Proposed

HISTORIC CONDITIONS					
Design Pnt	**Trib Basin(s)**	**Trib Area (ac)**	**Retention Pond(s)**	**Peak Q_{100} (cfs)**	**V_{100} (ac-ft)**
DP1	Pr 3, Pr 5, Pr 6, Pr1, Pr2, Pr10, Pr7	87.7	7, 5, 1, 2, 3	38.7	8.2
DP2	Pr 4, Pr11	27.1	4	11.9	2.3
DP3	Pr 13, Pr14, Pr12, OS1	7.8	8	3.5	0.4
DP4	Pr 8	16.9	6	10.6	1.6

DR-4 Conveyance Capacities - A single culvert is proposed with Phase 2 and the hydraulic analysis is included in the Phase 2 report (Appendix A p. 52-54). This culvert operates under outlet control up to 4 cfs and inlet control at flow rates greater than 4 cfs. The 100-year peak flow of 22 cfs overtops the road with a depth of less than 6 inches.

DR-5 Phase I – The Phase 2 report includes a complete analysis of both Phase 1 and Phase 2 facilities and shows that Phase 1 facilities are not overloaded and offsite flow is not increased in rate or volume from historic conditions.

C-300-1 Culvert Profile – Invert elevations and length for the culvert as well as ROW lines and easement lines are shown on the roadway plan. Cover over the culvert is shown on the road profile. The typical roadside swale is modified in the vicinity of the culvert inlet and outlet as shown by the contours in the plan view. The culvert rating curve is included in the Phase 2 report (Appendix A)

C-300-2 Pond – See response to DR-3

C-301-1 Pond – See response to DR-3

C-302-1 Concentrated Flow to Offsite – Under historic conditions the tributary area draining to the north is 0.96 acres. The proposed tributary area is 0.68 acres.

C-302-2 Overflow onto Lots

DRAFT

C-302-3 Ponded Water

C302-4 Pond

C304-1 Pond

C-500-1 Infiltration Basin Detail

C-500-2 Road Section – The road section shown is the Teton County standard road section (See page 12 of the Highway and Street Guidelines for Design and Construction adopted by Teton County) and was approved with Phase 1 plans. Using roadway design parameters included in the geotechnical report by Womack & Associates, Inc. dated December 17, 2007, the proposed county road section results in a SN=1.83 and is adequate. ($SN=a_1D_1 + a_2D_2$, where $a_1=0.14$; $a_2=0.10$; D_1=depth of base course; D_2=depth of subbase)

C-501-1 Fire Hydrant Supply Line – The net positive suction head available ($NPSH_a$) was calculated as follows:

$$NPSH_a = h_a - h_{vp} - h_s - h_f$$

where

h_a = absolute pressure / barometric pressure = 30.07 inches Hg = 34.8 ft (from National Climatic Data Center data from 1988 to 2011 for station located at REXBURG-MADISON COUNTY APT (KRXE))

h_{vp}= vapor pressure = 1.2 ft (based on temperature of $80^{O}F$ which is the average maximum monthly temperature for July and August per Western Regional Climate Center from 8/ 1/1904 to 8/31/2012)

h_s= static head = 13 ft (height difference from intake to pump on truck)

h_f = friction losses = 5.1 ft (see enclosed calculations)

$NPSH_a$ = 15.5 ft = 36 psi > 20 psi required, therefore o.k.

Please let me know if you have any questions or need additional information.

Sincerely,

Jennifer Zung, PE
Harmony Design & Engineering

Enclosure

DRAFT

From: Gerald Williams
Sent: Tuesday, October 02, 2012 10:04 AM
To: 'Jennifer Zung'; Curt Moore
Subject: RE: Blue Indian Review Comments

Jennifer:

The submitted letter and attached calculations look good except for one thing: the NPSHa of 15.5 feet = 6.7 PSI, not 36 PSI. The conversion factor was applied the wrong direction.

DEQ requires 20 psi minimum to the hydrant, but this is not connected to a public water system. Typically what I see required is a minimum of 5psi as a safety factor that there will not be a vacuum break when pumping from the hydrant, but the required minimum will be what the fire chief/marshall requires. Please confer with that person as to what minimum pressure they need to have (20 psi is 46.2 feet and not available for any of the pond and dry hydrant solutions, so I know that cannot be the criteria), and then report back as to the requirement and that your design meets it.

Gerald R. Williams, P.E., CFM, President

WILLIAMS ENGINEERING, INC.