



April 6, 2011

Mr. Scott Chism, P.E.
City of Aspen Parks Department
585 Cemetery Lane
Aspen, Colorado 81611

WRC File: 2127/17

RE: Aspen Rio Grande Regional Stormwater Quality Facility
Preliminary Analysis of Modified Water Quality Ponds

Dear Scott:

WRC Engineering, Inc. (WRC) is pleased to present the results of its preliminary analysis of the water quality ponds at Rio Grande Park per WRC's proposal No. P-1627 as approved on April 4, 2011. WRC is in receipt of the proposed grading plans prepared by Aspen for the ponds and adjacent theater tent facilities. The information provided herein is based on those plans and on WRC's previous hydrology/hydraulics work for Aspen pertaining to the Rio Grande Regional Stormwater Quality Facility.

Task 1 – Water Quality Pond Volumes

WRC determined the total volume and the maximum water quality volume provided by each of the ponds per the proposed grading. These volumes are presented in Table 1 below. Please note that these are the maximum available storage volumes before overtopping of the pond. The actual available water quality volume is less than these in order to provide a depth of flow over outlet weirs.

Table 1 - Pond Volumes per Proposed Grading

Pond Number	Permanent Pool Water Surface Elevation	Permanent Pool Volume, acre-feet	Maximum Pool Water Surface Elevation	Maximum Pool Volume, acre-feet	Maximum Water Quality Volume Provided, acre-feet
Pond 1 (upper-most pond)	7875.0	0.104	-	-	-
Pond 2	7873.5	0.051	7874.0	0.066	0.015
Pond 3 (large middle pond)	7869.5	0.360	7873.0	1.167	0.807
Pond 4	7868.5	0.171	7870.0	0.257	0.086

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In addition to providing pond volumes, Aspen requested that WRC provide required sizing for a replacement to the existing culvert under the pathway at the outlet of Pond 4, and also that WRC establish the optimum channel width for the connection between Pond 3 and Pond 4 for use in sizing and design of a future replacement bridge at that location. However, both tasks require an administrative decision by Aspen regarding the design storm for these facilities. In order to provide Aspen with some initial baseline information, we have provided a conceptual facility sizing and conceptual design based on the criteria that the “water quality storm event” (approximately a 1-year to 2-year recurrence) must be passed entirely through the pond series, and the 10-year storm event must be controlled without inundation of the proposed tent structure. Larger runoff events are not considered for this conceptual design but we suggest these be discussed after Aspen’s review of the information in this letter report.

This conceptual design is based on the proposed grading previously provided by Aspen, with a focus on minimizing changes to that grading plan:

- At Pond 2, the grading plan indicates a permanent pool water surface elevation of 7873.5. WRC recommends that this water surface be lowered to 7873.0 to allow for separate control of the “water quality event” and the 10-year storm event runoff. A weir (effectively identical to the previously-envisioned drop structures between ponds) of 18.5-foot width would be constructed at an elevation of 7873.0 such that any depth in excess of the permanent pool elevation is passed to Pond 3. At a depth of one-half (0.5) foot, this weir would pass the peak flow of 17 cfs from the “water quality event”.
- Also at Pond 2, a second weir could be constructed on the north perimeter at elevation 7873.5. For storm events exceeding the “water quality event”, water would flow over both weirs. The north weir could release water into a grassy depression between Pond 2 and the existing trail along the river, where it would be drained by an approximate 24-inch pipe under the trail and into the river. When the water surface in Pond 2 reaches the maximum design level of 7874.0, water over the weir to Pond 3 will be one (1.0) foot deep with a flow rate of 48 cfs. Since the total peak inflow to the ponds during the 10-year storm event is 74 cfs, this leaves an excess of 26 cfs to pass over the north weir and into the 24-inch pipe. Based on this flow rate, the north weir would need to be approximately 28 feet wide.
- At Pond 3, the grading plan indicates a permanent pool water surface elevation of 7869.5. Water quality storage volume would be provided between the permanent pool at 7869.5 and the proposed weir overflow at 7872.0, providing approximately 0.54 acre-foot of water quality volume in Pond 3. An 18.5-foot wide weir / drop structure at elevation 7872.0 would allow runoff to pass to Pond 4. This weir would pass 48 cfs, which is the portion of the 10-year storm event routed to Pond 3, at a water surface elevation of 7873.0. To provide additional protection against inundation of the proposed theater tent, the grading plan could be modified to include a 6-inch or higher berm along the northwest perimeter of Pond 3.

The approximate locations of the improvements proposed in this conceptual plan are presented on Figure 1 (attached). Please note that all locations and sizes are approximate and based on preliminary analysis.

Task 2 – Culvert Sizing Under Existing Pathway

Based on the above conceptual design, the culvert under the pathway between Pond 4 and Pond 5 would be required to pass at least 48 cfs based on the 10-year storm event. To allow for the proposed permanent pool water surface elevation of 7868.5, Aspen would need to install a box culvert or opening of 1-foot height and 10-foot width, or another sizing with equivalent capacity to maintain the 10-year water surface below 7872.0 so as not to reduce the weir capacity out of Pond 3.

If the north bypass weir is not constructed at Pond 2, the entire 10-year flow would be passed through the pond series. Given the same water surface elevation constraints, the culvert size required to pass the entire 10-year runoff of 74 cfs would be a box culvert or opening of 1-foot height and 14.2-foot width, or another sizing with equivalent capacity.

Task 3 – Optimum Channel Width at Future Bridge

Finally, based on the presented conceptual design and assumed criteria, the weir structure at the outlet of Pond 3 has a width of 18.5 feet. Any bridge design at this location would be required to span at least that width, and provide clearance for flows up to an elevation of at least 7873.0.

Again, given the same water surface elevation constraints, the weir structure required to pass the entire 10-year runoff of 74 cfs would have a width of at least 28.5 feet. Thus, any bridge design would need to span at least that width, and provide clearance for flows up to an elevation of at least 7873.0.

Thank you for the opportunity to provide continued engineering services and support to the City of Aspen for this project. Please do not hesitate to contact me to discuss the information presented here or for additional assistance.

Sincerely,
WRC ENGINEERING, INC.

A handwritten signature in black ink, appearing to read "Alan J. Leak".

Alan J. Leak, P.E.
President

