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Lawrence, Kansas
Bowersock Dam Maintenance

B&V Project 160988
B&V File B-1.1
February 17, 2009

Mr. Philip Ciesielski
Assistant Director of Utilities
City of Lawrence
720 W. Third Street
P.O. Box 708
Lawrence, Kansas 66044-0708

Subject: January 23, 2009 Inspection

Dear Mr. Ciesielski:

On January 23, 2009, a visual inspection of the downstream face of the Bowersock Dam in Lawrence, Kansas was performed to assess the condition of the dam and to determine if any significant changes had occurred since the last inspection was made in October 2006, as documented in our February 14, 2007 letter report. The inspection was made by Mark Bushouse, Scott Brand, and Jacques Moraille of Black & Veatch (B&V), Stephen Hill, Sarah Hill-Nelson, and Rich Foreman of Bowersock Mills & Power Company (Bowersock), Peggy Harding, John Zygaj, and Teo Strat of the Federal Energy Regulatory Commission (FERC), and Kimberly Feldkamp of the Kansas Department of Agriculture Dam Safety Program.

River flows had been reduced through coordination between Bowersock and the US Army Corps of Engineers (COE) to allow the top of the dam to be exposed with little flow over the top for brief time periods, depending on river ice flow conditions. Flow was diverted through the power house and the north spillway. However, ice accumulations within the power house influent flume required turbines to be cycled off to remove the ice, and then turned on again to drop the pool level below the top of the dam. A short, 20-minute window of opportunity allowed a brief visual inspection of the downstream face of the dam with limited flow over the dam. A slight flow of water over the top of the dam obscured some of the dam facing from observation. The wet face of the dam and the short inspection window did not allow for location stationing to be marked on the dam face. Inspection photographs are included in the attached Appendix A, and stationing relative to the stationing established during the October 2006 inspection has been approximated. Where possible, references to the October 2006 photographs have been made.

Areas of primary interest were those where significant leaking had been present during the October 2006 inspection. These locations were quickly located to determine whether significant flow had returned since the grout bag installation which was performed on November 2, 2006.

- The primary area of concern was near Sta 3+90, where the largest flow through the dam was observed in October 2006. A significant amount of flow was not observed at that

location. Due to the slight flow over the top of the dam at this location, it was difficult to determine if any flow was coming through the dam versus over the dam at this location. Based on this observation, it appears that the grout bag installation is still effective in reducing the flow at this point. Refer to photographs 16 and 17.

- A new area of leakage through the apron was observed near Sta 4+40. See photograph 13.

- The area between Sta 3+25 and Sta 3+40 was relatively dry during this inspection and a large section of timber cribbing that was previously obscured due to flow over the dam in 2006 was visible. It appears that additional erosion of the prior protective grout repair has occurred in this area. Refer to photographs 22, 23, 24, 25, 26, and 27.

- Due to the flow over the dam, it was difficult to determine whether the flow discharging from eroded timber holes was coming through the dam or from flow over the dam. However, areas which had presented flow through the dam in 2006 did not necessarily exhibit flow at the time of this inspection. As indicated above, this may be attributable to the prior grout bag installation.

- The general condition of the concrete remains the same, with the exception of a few locations where additional spalling or erosion of the concrete has occurred. However, the amount of new spalling is minimal.

Based on the conditions observed during the brief visual inspection, it does not appear that any changes to the planned short-term repair work need to be made and the maintenance activities should proceed as planned as soon as flows in the river allow, or if flow can be diverted around the areas requiring repair.

Preparations are underway to finalize the construction contract with L.G. Barcus & Sons so that the project can proceed when flows allow.

Sincerely,

BLACK & VEATCH CORPORATION

Mark D. Bushouse
Engineering Manager

mdb
Enclosures

1. South dam Sta 6+00 to south end.

2. South dam Sta 4+50 to Sta 7+50.

3. Dam overview Sta 0+00 to 7+50.

4. Dam overview Sta 0+00 to Sta 6+50.

5. Sta 1+25 to 5+60.

6. Sta 0+00 to Sta 5+00.

7. Sta 0+00 to Sta 4+00.

8. Sta 4+50 to Sta 6+35.

9. Sta 5+50 to Sta 6+50. Location of 2006 scour hole at Sta 5+80± located downstream of 7th batterboard (No. 58) north (right) from concrete pylon.

10. Sta 6+35 to Sta 6+75. Scour or eroded concrete under ledge @ Sta 6+60±.

11. Sta 6+50 to Sta 7+00. Non-visible scour hole downstream from Obermeyer gate #7 south (right) from pylon as indicated in 2006 dive inspection.

12. Sta 7+00 to south end.

13. Sta 4+40. Leak bubbling up thru start of apron.

14. Sta 4+40. Water draining into eroded concrete and exposed timber hole. (See #98, 2007 Report.)

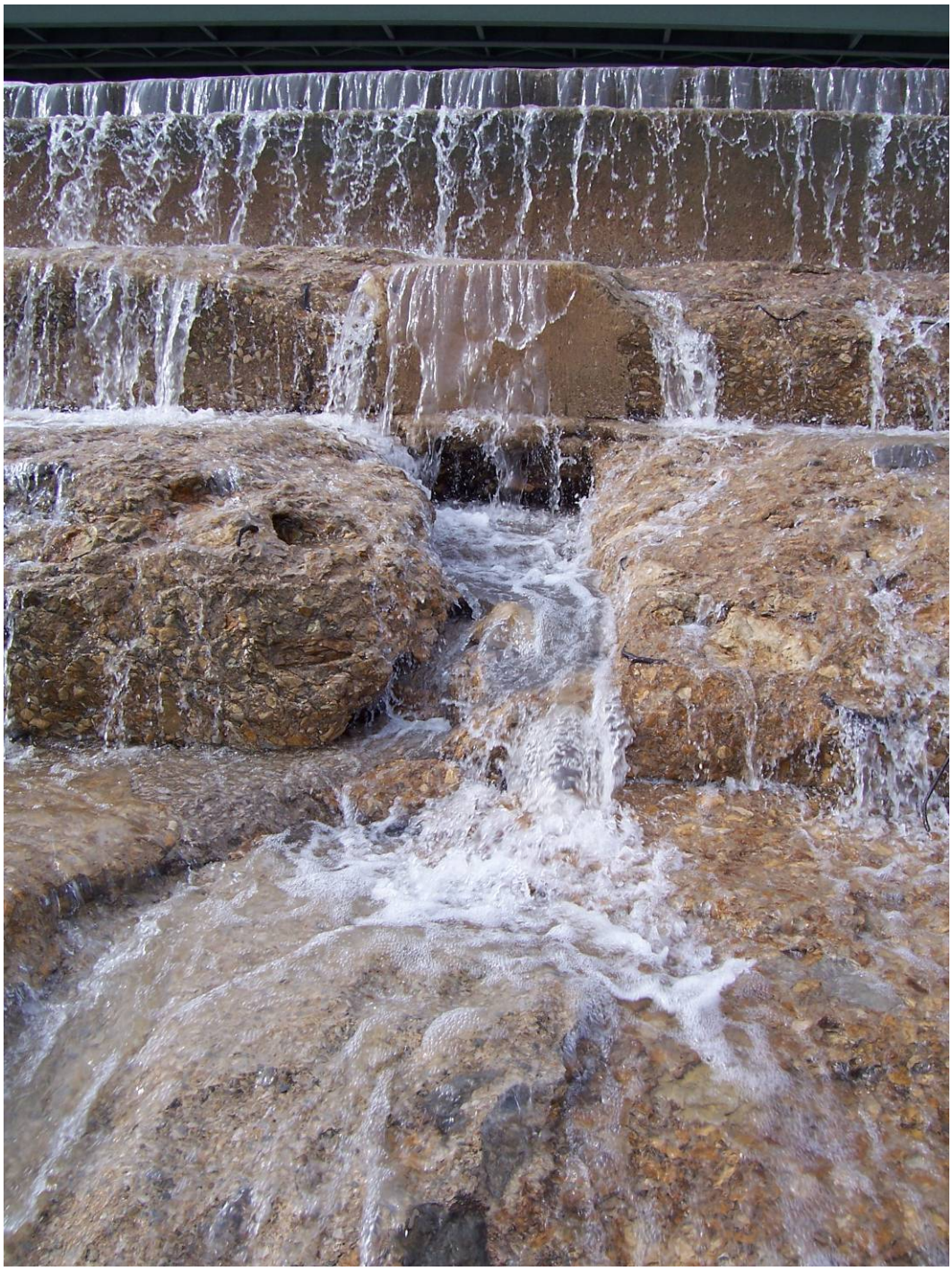
15. Sta 3+90±. Water flowing into eroded concrete with exposed wire mesh in top step. (See #55 & 99, 2007 Report.)

16. Sta 3+90±. Location of prior significant leak. 4 ft deep hole in second step. (See #50, 52, 53, 54, 56, 58, 100, 102 in 2007 Report.)

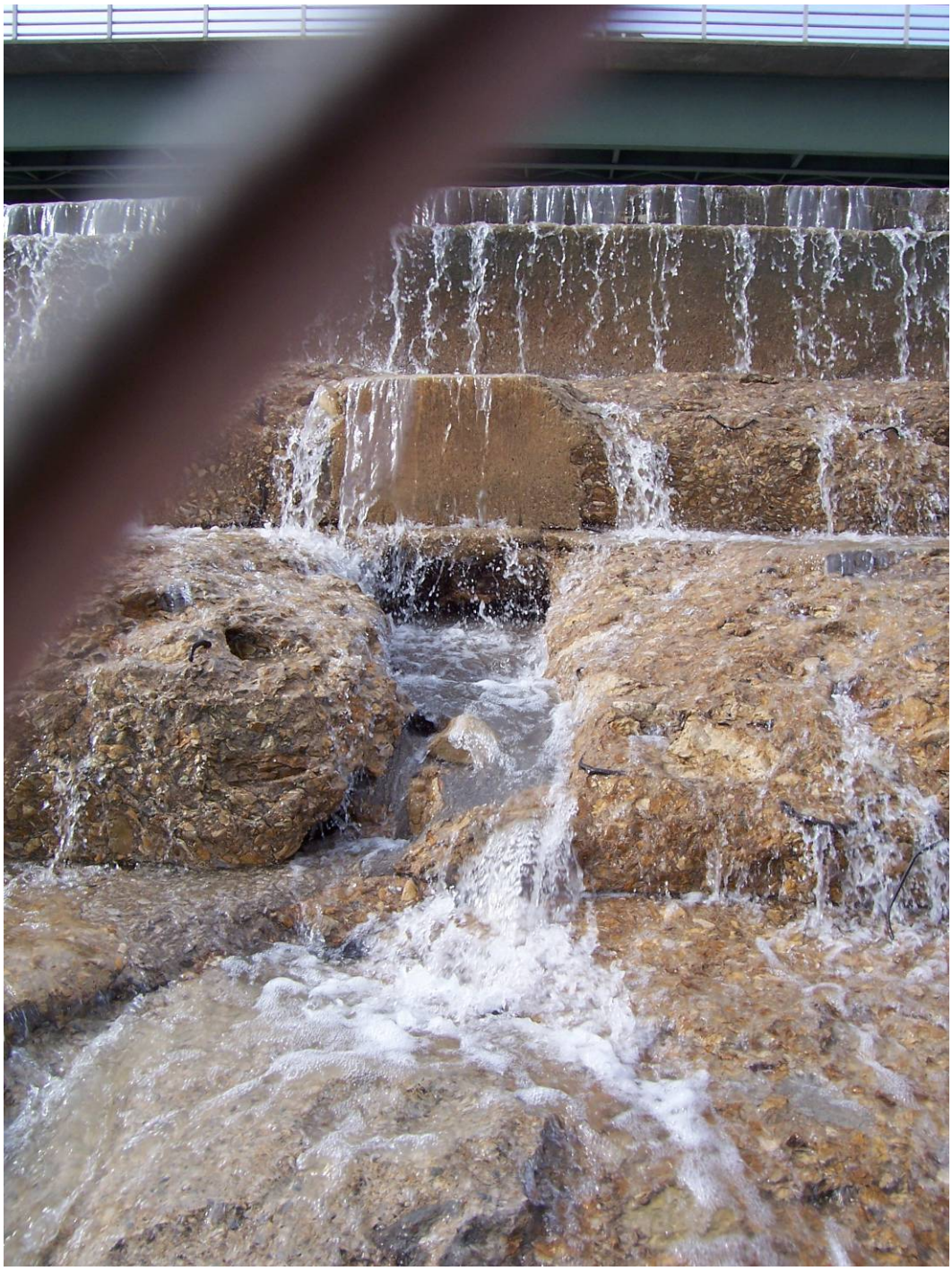
17. Sta 3+90±. Location of prior significant leak. 4 ft deep hole in second step. (See #50, 52, 53, 54, 56, 58, 100, 102 in 2007 Report.)

18. Sta 4+25. Deteriorated joint & exposed rebar at top of bottom step. (See #57 in 2007 Report.)

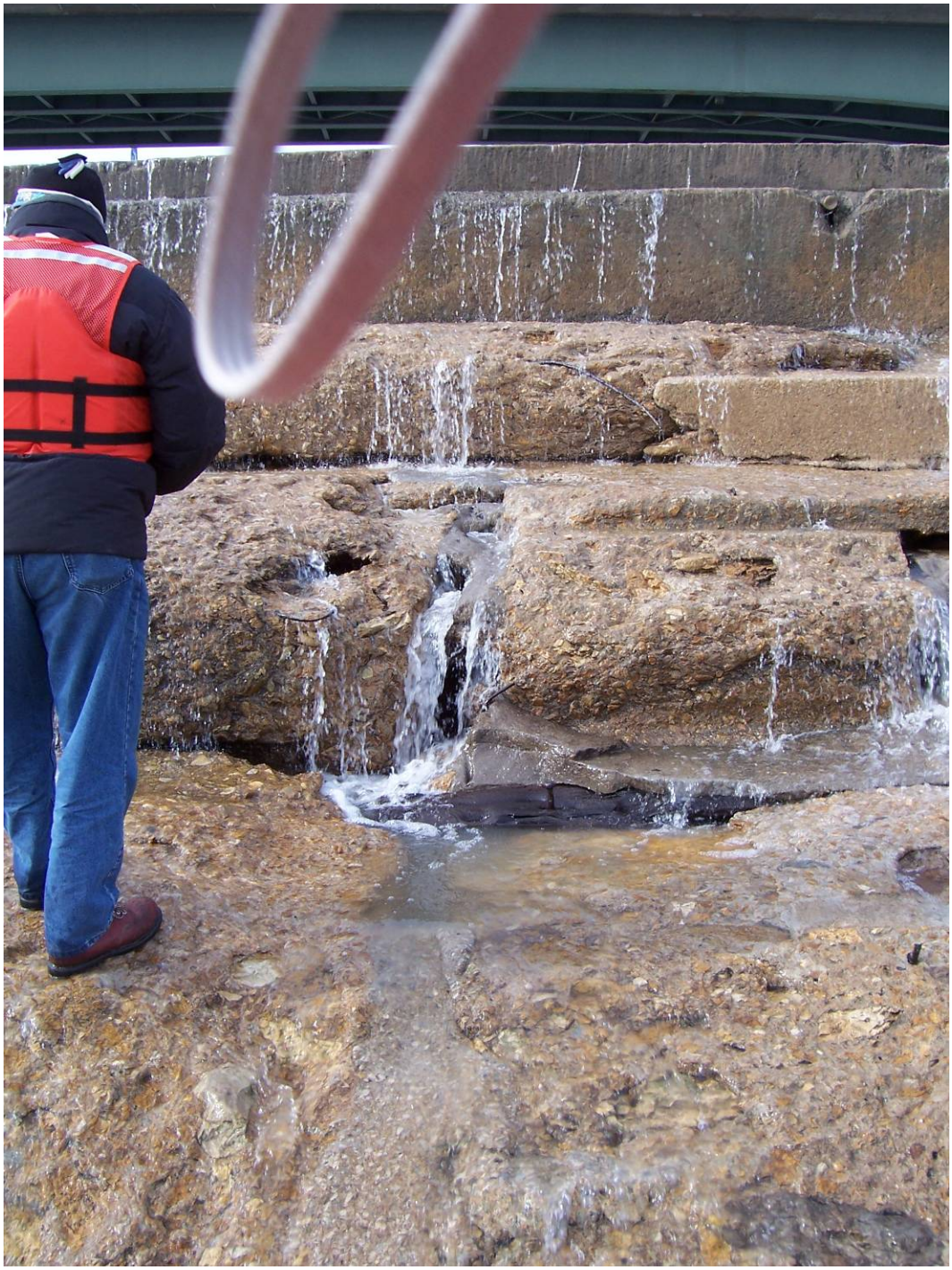
19. Sta 3+75±. (See #52, 2007 Report.)



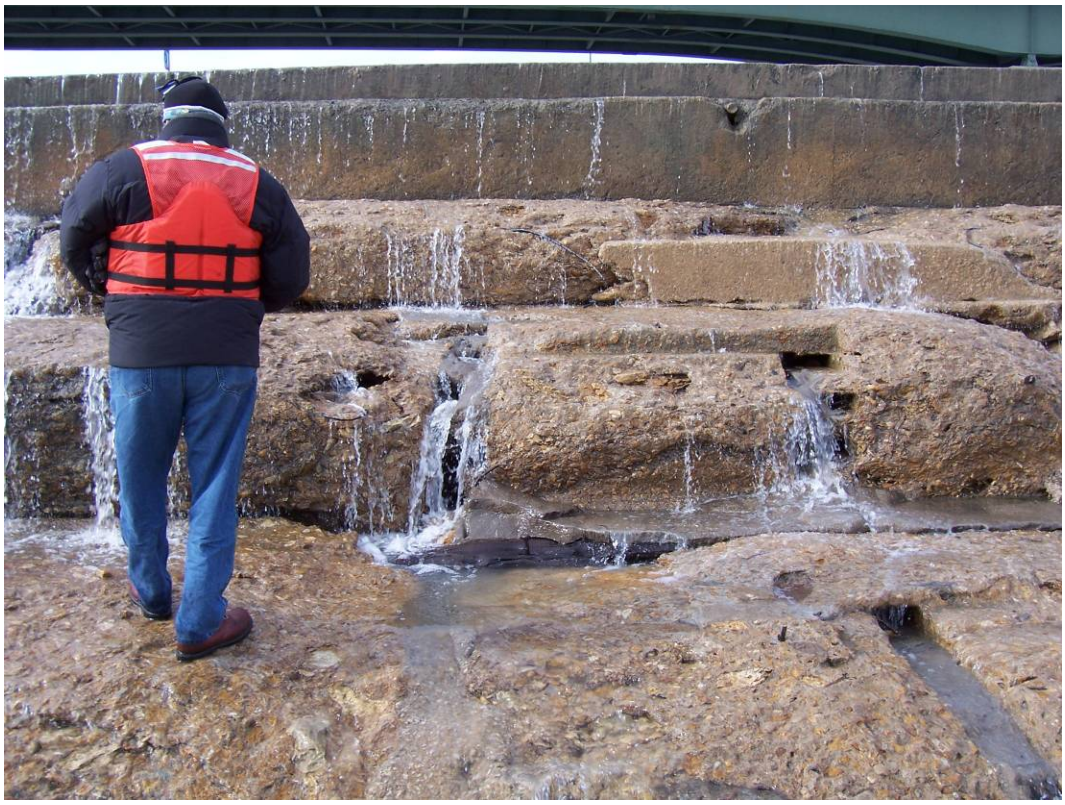
20. Sta 3+70±. (See #52, 2007 Report.)



21. Sta 3+70±. (See #52, 2007 Report.)



22. Sta 3+40. Eroded timber holes, exposed timber, eroded concrete.
(See #46, 47, 2007 Report.)

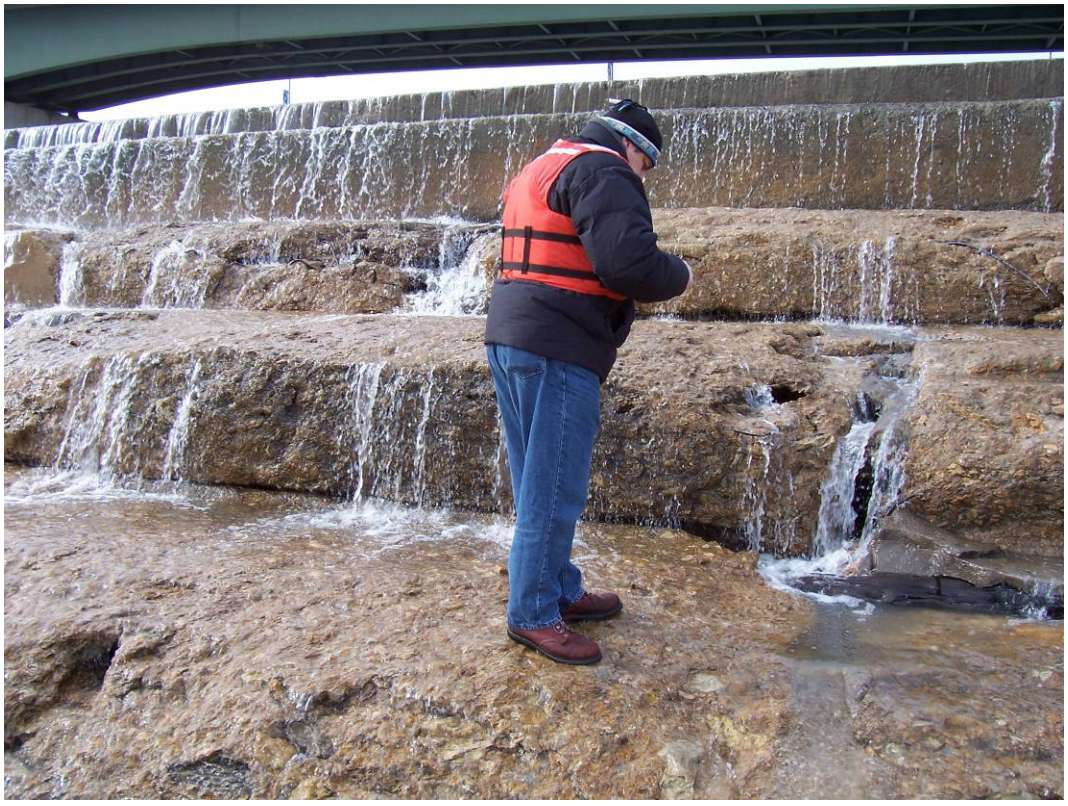


23. Sta 3+40. Eroded timber holes, exposed timber, eroded concrete.
(See #45, 46, 47, 2007 Report.)

24. Sta 3+40. Eroded timber holes, exposed timber, eroded concrete.
(See #45, 46, 47, 2007 Report.)

25. Sta 3+25. Eroded timber holes, exposed timber, eroded concrete. (See #46, 47, 2007 Report.)

26. Sta 3+25 north to Sta 1+25. (See #42, 43, 2007 Report.)



27. Sta 3+40 to 3+50. Exposed timber, eroded timber holes.

28. Sta 3+50 to Sta 3+70. Severely deteriorated concrete. Eroded timber holes.

29. Sta 3+60 to Sta 4+00. Severely deteriorated concrete. Eroded timber holes.

30. Sta 3+30. Severely deteriorated concrete. Eroded timber holes.

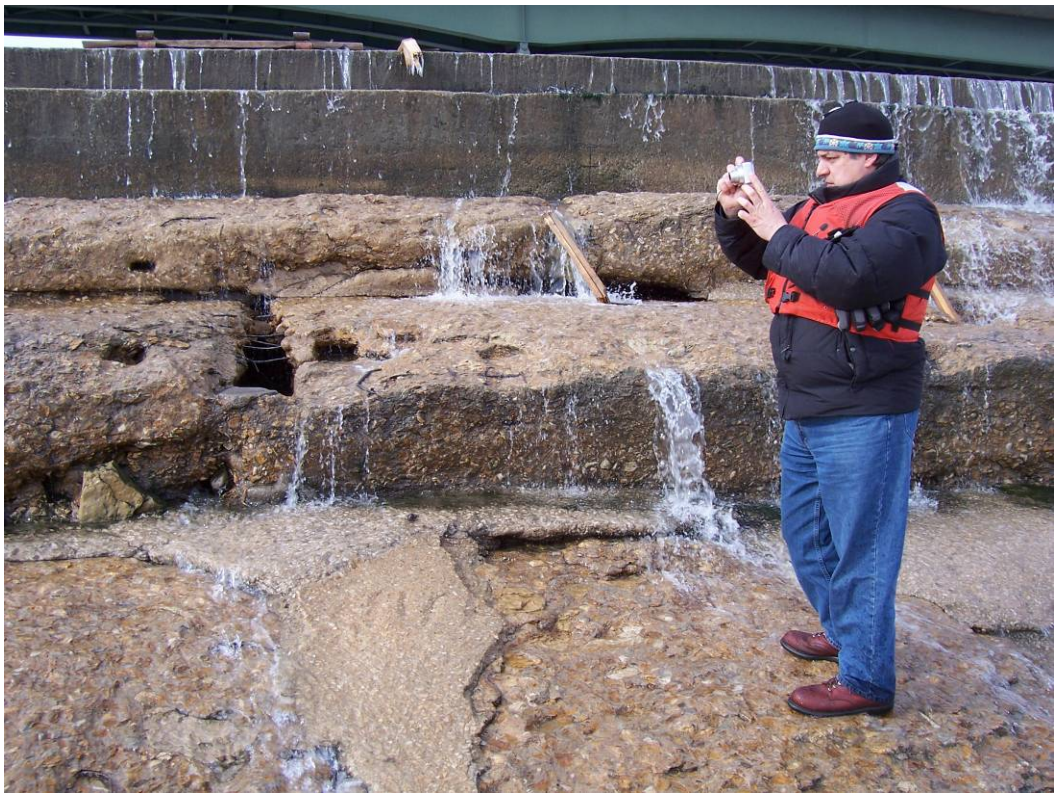
31. Sta 3+25. Severely deteriorated steps. (See #42, 2007 Report.)

32. Sta 3+00 to Sta 3+20. Exposed and eroded timber holes, exposed rebar, severely deteriorated steps. (See #39-41, 2007 Report.)

33. Sta 2+50 to Sta 3+60. Exposed and eroded timber holes, exposed rebar, severely deteriorated steps. (See #39-41, 2007 Report.)

34. Sta 3+00 north to Sta 1+25.

35. Sta 3+00. Exposed and eroded timber holes, exposed rebar, severely deteriorated steps. (See #39-41, 2007 Report.)



36. Sta 3+00. Exposed and eroded timber holes, exposed rebar, severely deteriorated steps. (See #39-41, 2007 Report.)

37. Sta 2+95. Exposed joint between 2nd & 3rd steps, severely deteriorated lower step. (See #41, 2007 Report.)

38. Sta 2+80. Exposed timber and eroded concrete. Crack in bottom step.
(See #37 and 38, 2007 Report.)

39. Sta 2+75. Exposed joint and cracked middle step crack in bottom step, weep hole. (See #36, 2007 Report.)

40. Sta 2+80. Exposed timber and eroded concrete. Crack in bottom step. (See #37 and 38, 2007 Report.)

41. Sta 2+75. Exposed joint and cracked middle step crack in bottom step, weep hole. Additional erosion since 2006. (See #36, 2007 Report.)

42. Sta 2+65. Eroded concrete and exposed timber hole. Additional erosion since 2006. (See #31, 33, 34 & 35, 2007 Report.)

43. Sta 2+50. Exposed joints between steps eroded concrete. (See #30-32, 2007 Report.)

44. Sta 2+45. Exposed joints between steps eroded concrete. (See #30 and 32, 2007 Report.)

45. Sta 2+40. Deteriorated concrete steps. Exposed joints. (See #29, 2007 Report.)

46. Sta 2+70±. Existing crack in apron to new apron interface. No apparent change.

47. Sta 2+40±. Deteriorated steps and exposed joints. (See #27 and 29, 2007 Report.)

48. Sta 2+40 to 2+80±. Deteriorated steps.

49. Sta 2+50 to Sta 3+00±. Deteriorated steps.

50. Sta 2+40 to Sta 3+00±. Existing crack in apron. No apparent change.

51. Sta 2+40 to Sta 2+80. Existing crack in apron. No apparent change.

52. Sta 2+40 to south. Deteriorated steps.

53. Sta 2+40± to south. Exposed wire fabric and eroded shotcrete. (See #29, 2007 Report.)

54. Sta 2+40± to south. Exposed wire fabric and eroded shotcrete. (See #29, 2007 Report.)

55. Sta 1+90± to south. Separated triangular section in bottom step. Eroded concrete. (See #108, 2007 Report.)

56. Sta 1+80± to north. Eroded concrete step.

57. Sta 1+80± to north. Eroded concrete step.

58. Sta 1+25 to northwest. Eroded shotcrete. (See #18, 2007 Report.)

59. Sta 1+25 to south. Eroded shotcrete.

60. Sta 1+25 to south. Eroded concrete. Exposed bar. (See #17 & 19, 2007 Report.)

61. Sta 1+25. Spillway. (See #15-18, 2007 Report.)

62. Sta 1+15±. Spillway. (See #12 &15, 2007 Report.)

63. Sta 0+75. Spillway.

64. Sta 0+75. Spillway to north.

65. Sta 0+80 to north. Flow through spillway.

66. Sta 0+80 to north. Flow through spillway.

67. Sta 0+80 to northeast. Flow from spillway across apron.

68. Sta 2+75±. Exposed, eroded reinforcing steel on first step. (See #36, 2007 Report.).

69. Sta 2+95±. Void between lower and middle steps. (See #41, 2007 Report)