Appendix E

Bathymetry Study

Contents

Abbreviations and Acronyms

USBR	United States Department of the Interior Bureau of Reclamation
SJR	San Joaquin River
DMC	Delta-Mendota Canal
cfs	cubic feet per second
kg/m^3	kilogram(s) per cubic meter
GPS	global positioning system
NTU	nephelometric turbidity unit
mg/L	milligram(s) per liter

Appendix E
Bathymetry Study

E1 Purpose

The United States Department of the Interior Bureau of Reclamation (USBR) is evaluating the feasibility of using recirculation strategies to improve water quality and flows in the lower San Joaquin River (SJR). Specifically, USBR is evaluating the feasibility of the Delta-Mendota Canal (DMC) Recirculation Project, which involves recirculating water from the Sacramento–San Joaquin River Delta through the DMC by way of Newman and Westley Wasteways.

The 2008 Pilot Study involved a small-scale and short-term implementation of recirculation through Newman Wasteway.

This appendix presents the results of the erosion and deposition estimate calculations that were completed in conjunction with the 2008 Pilot Study.

E2 2008 Pilot Study and Survey Data

Newman Wasteway is a Central Valley Project facility designed to convey emergency releases from the DMC to the SJR. The Wasteway flows from west to east and has its headgates on the DMC, just upstream of Check 10 at Mile Post 54.38. The Wasteway is approximately 8.2 miles long; the upper 1.5 miles of the Wasteway are concrete lined, and the remaining 6.7 miles of the Wasteway are unlined. Because a large amount of sediment accumulation occurs in the unlined section, flow sent through the Wasteway has the potential to cause large sediment migration down the Wasteway to the SJR.

Between July 29, 2008, and September 15, 2008, USBR released flows of between 50 and 250 cubic feet per second (cfs) through the headgates into the Newman Wasteway. The average flow during this period was about 221 cfs, and 21,593 acre-feet of water were released. Table E-1 shows the flow release schedule that USBR maintained during this period.

On July 25, 2008, before the start of the 2008 Pilot Study, a team of URS land surveyors completed a global positioning system (GPS)-based survey of 10 cross sections along the Wasteway alignment (see Figure E-1 for survey locations). During the pre–pilot study survey, mud and vegetation obscured the location of the low-flow channel at some of the cross sections, and the survey team was not always able to locate the low-flow channel on the surveyed section.

Table E-1. Flow Releases from DMC to Newman Wasteway During Recirculation

Date	Time (24-hour)	Release Rate (cfs)	Duration (hours)
Tuesday, July 29, 2008	6:01	36	1
Tuesday, July 29, 2008	7:00	56	1
Tuesday, July 29, 2008	8:00	100	0.4
Tuesday, July 29, 2008	8:25	129	1.6
Tuesday, July 29, 2008	10:00	154	2
Tuesday, July 29, 2008	12:00	219	2
Tuesday, July 29, 2008	14:00	232	0.5
Tuesday, July 29, 2008	14:30	250	39.5
Thursday, July 31, 2008	6:00	100	174
Thursday, August 07, 2008	12:00	250	931
Monday, September 15, 2008	7:00	0	—

cfs = cubic feet per second

The URS land surveyors conducted a survey of the same 10 cross sections on September 22, 2008, after the completion of the pilot study. The URS survey team encountered soft sediment at cross sections 4, 5, and 9, and as a result, the team was not able to survey the entire width of the Wasteway at these locations.

Figures E-2 through E-11 show the results for the surveyed cross sections for Sections 1 through 10, respectively.

E3 Erosion and Deposition Calculations

The net amount of erosion from the Newman Wasteway can be estimated from the flow and turbidity data collected at the mouth of the Wasteway. The average flow diversion rate was 223 cfs, for a total flow volume of 21,593 acre-feet (Mark Walsh, personal communication, 2009; Recirculation 2008.xls). This was measured at the head of the Wasteway. The average turbidity near the Wasteway terminus was 215 nephelometric turbidity units (NTU) (Figure E-12). Figure E-13 shows the conversion from turbidity units (NTU) to total suspended solids (milligrams per liter [mg/L]); the following conversion rate was assumed: 1 NTU = 1 mg/L. From these data, the total mass of sediment removed from the Wasteway was calculated to be 5.7 million kilograms. Note that the flow data collected at the terminus of the Wasteway indicates that up to 50 cfs could have been lost in the Wasteway. In this case the above estimate would be an overestimate of the mass of sediment removed from the Wasteway.

The length of the unlined portion of the Wasteway is 6.7 miles. Assuming an average bottom width of 80 feet, a porosity of 0.30, a particle density of 2,650 kilograms per cubic meter (kg/m^3), the average depth of scour is about 0.5 inch over the entire unlined portion of the Wasteway. If most of the scour occurs from the low-flow channel, which averages about 30 feet wide, the scour depth is about 1 inch. Note that these values are averages, the actual erosion would likely be greater (perhaps much greater) at some locations and possibly depositional at other locations.

A comparison of the surveyed sections from the pre–pilot study to the surveyed sections from the post–pilot study shows a clear low-flow channel in many of the post–pilot study surveyed sections that is not evident in the pre–pilot study surveyed sections. A review of the locations of the actual survey points indicates that the lack of low-flow channel in the pre–pilot study survey sections is most likely due to the location of the survey points rather than the scouring of a low-flow channel. As mentioned above, it was difficult to survey the pre–pilot study sections due to vegetation and mud, and as a result, the low-flow channel was often missed.

During the pre–pilot study survey, two cross sections were measured at each location. These two sections provide a measure of the local variability in the shape of each cross section. Scour is only assumed to have occurred at a section when the difference between the pre– and post–pilot study survey sections exceeds the variability between the two pre-pilot study sections. In general, any scour that occurred during the pilot study was small relative to the local variability in the two pre–pilot study cross sections and therefore cannot be estimated from the survey data. This finding is consistent with the rough calculations presented above, which indicate only about 0.5 to 1 inch of scour along the channel.

E4 References

Walsh, Mark. 2009. Written communication from Mr. Mark Walsh, Hydro Tech II, San Luis & Delta Mendota Water Authority, to Dr. Jeremy Bricker, Water Resources Engineer, URS, with attached file, Recirculation 2008.xls. January.

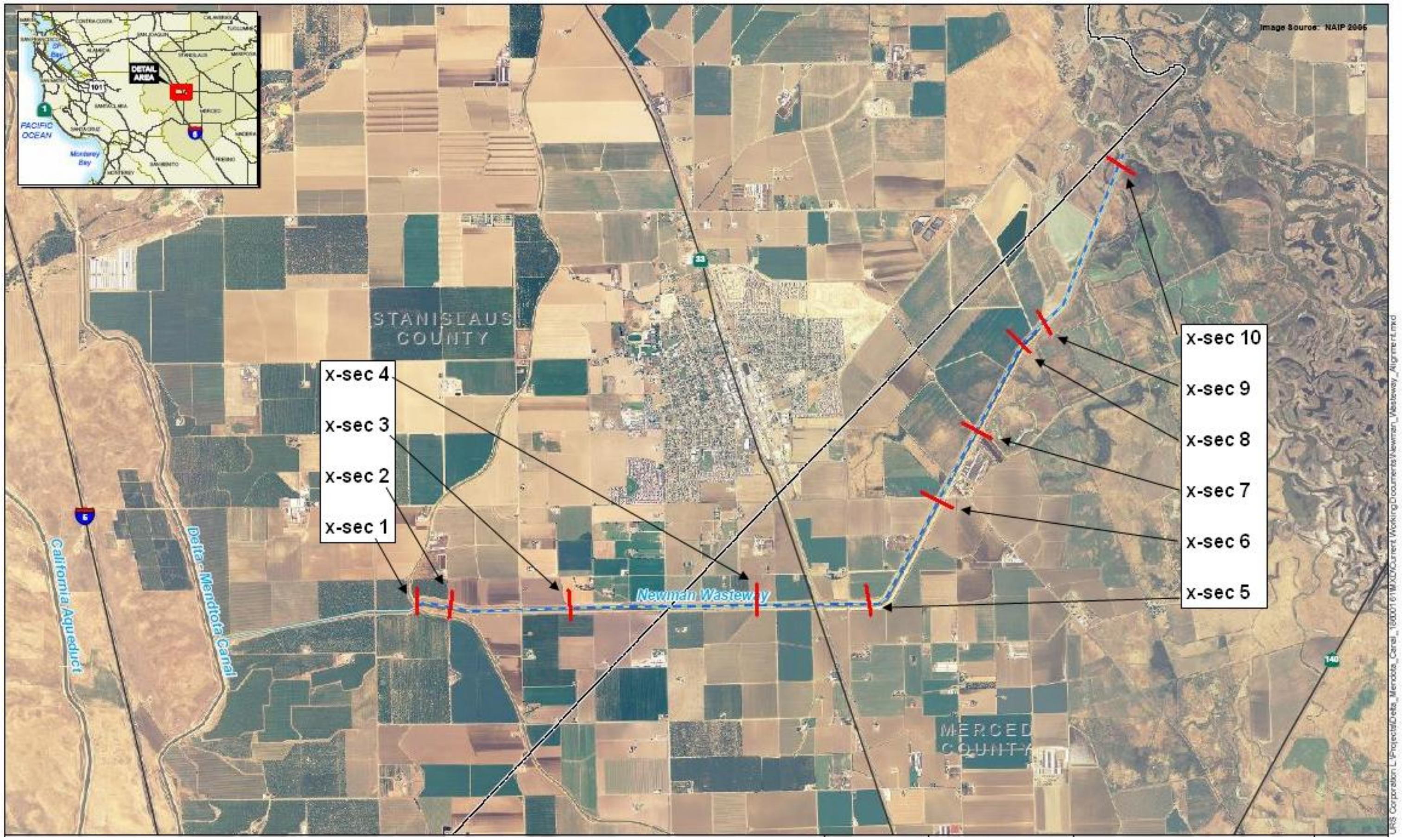

Figure E-1. Newman Wasteway Alignment and Cross-Section Locations

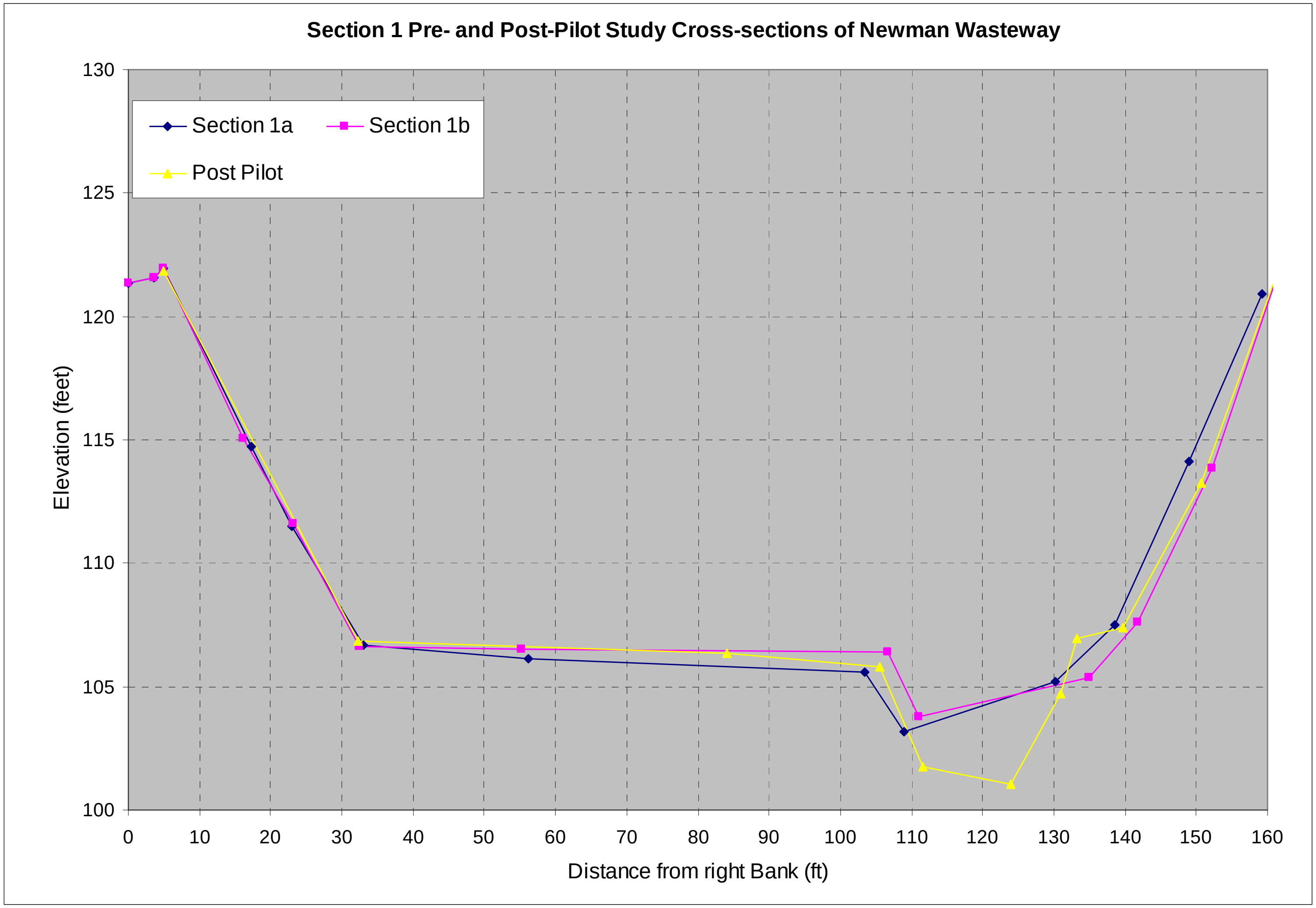

Figure E-2. Section 1: Pre- and Post–Pilot Study Cross Sections of Newman Wasteway

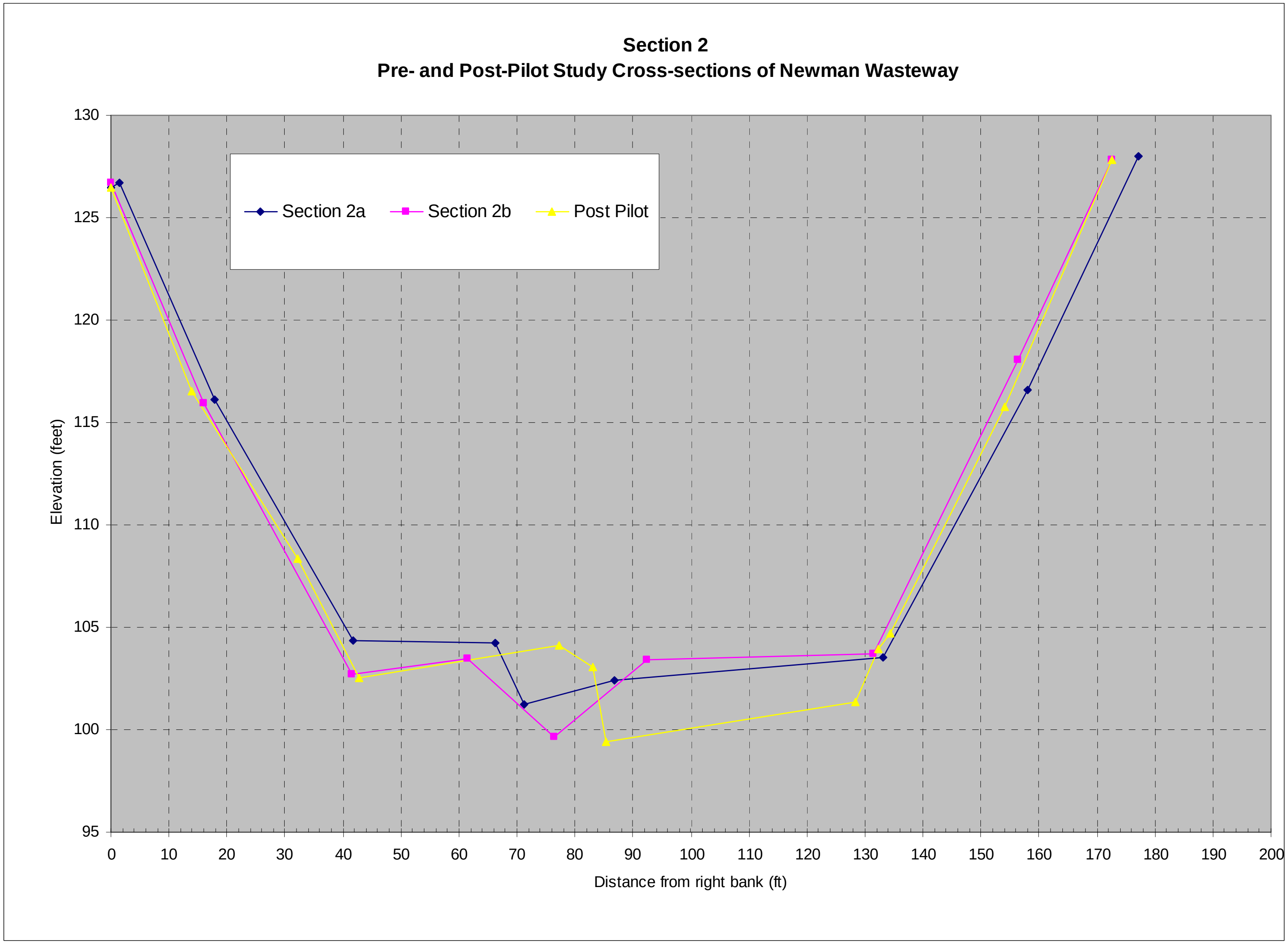

Figure E-3. Section 2: Pre- and Post–Pilot Study Cross Sections of Newman Wasteway

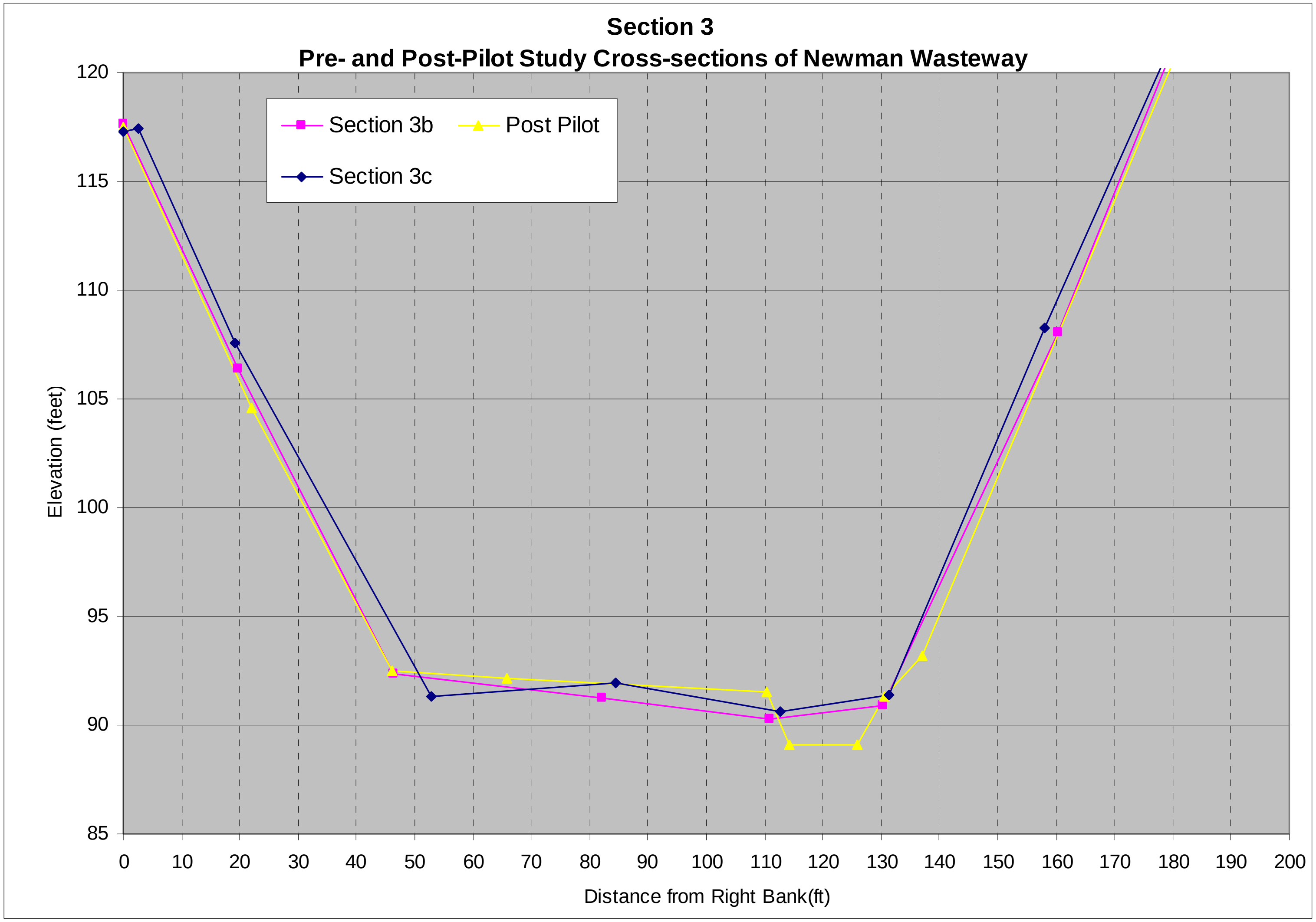

Figure E-4. Section 3: Pre- and Post–Pilot Study Cross Sections of Newman Wasteway

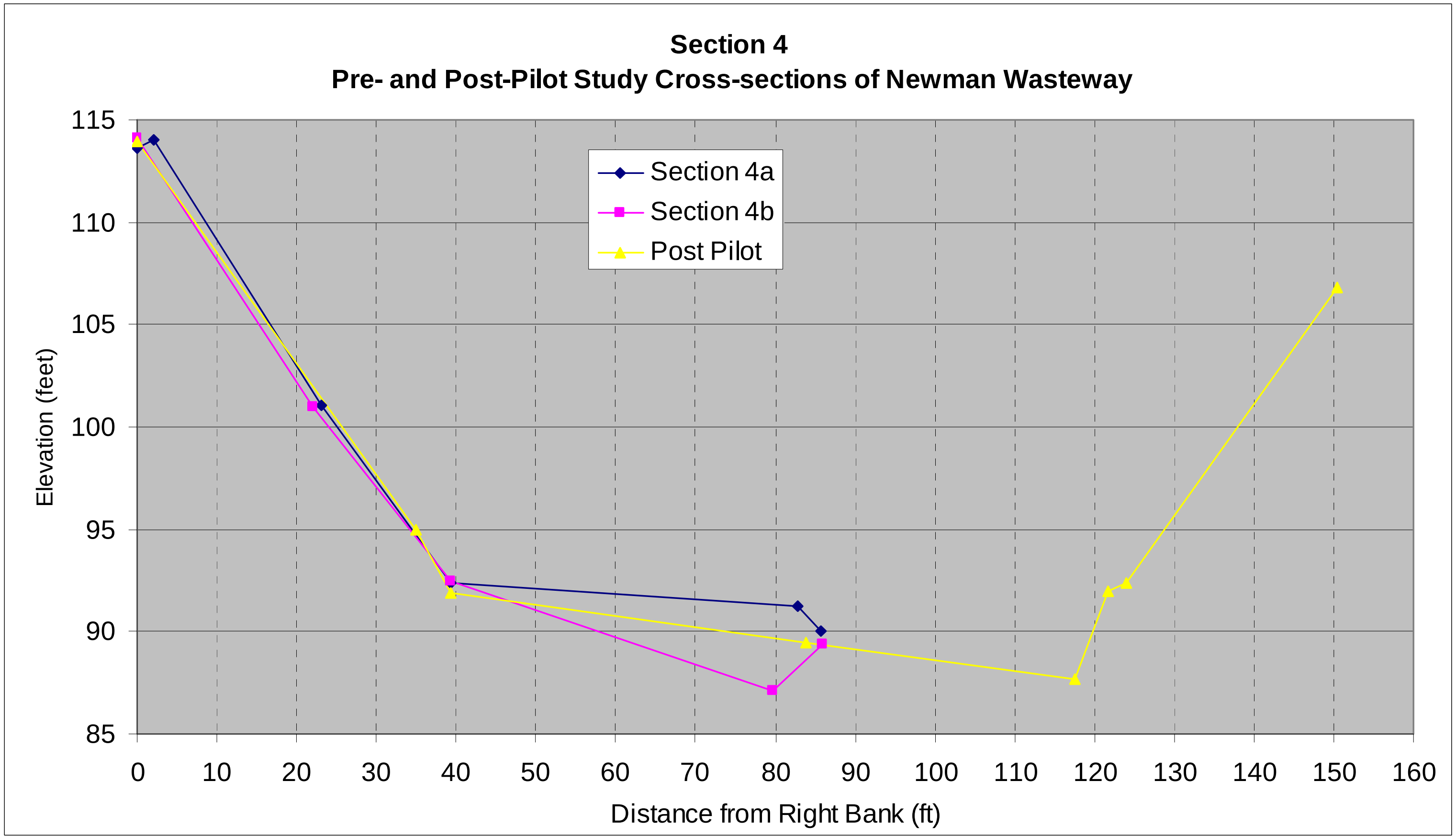

Figure E-5. Section 4: Pre- and Post–Pilot Study Cross Sections of Newman Wasteway

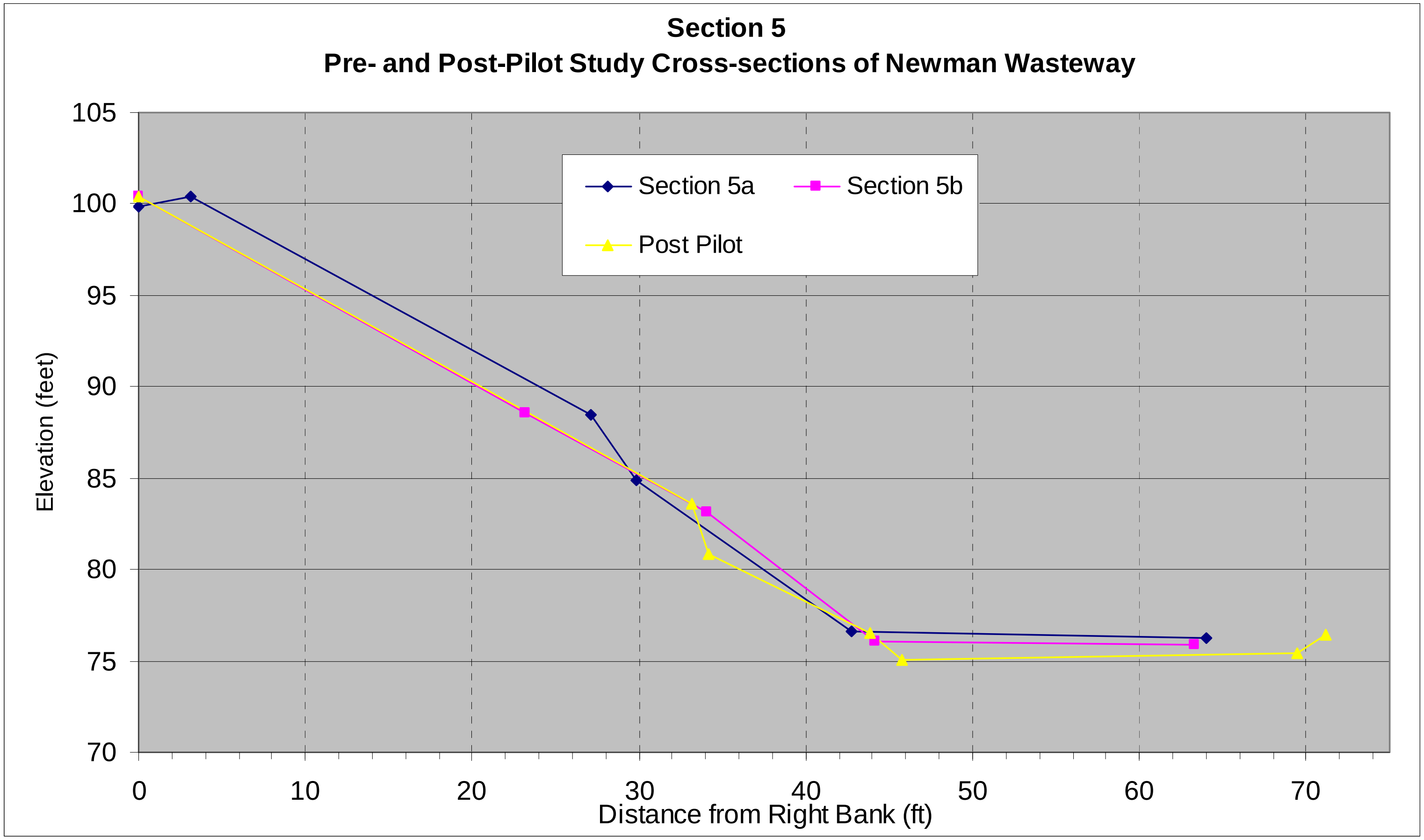

Figure E-6. Section 5: Pre- and Post–Pilot Study Cross Sections of Newman Wasteway

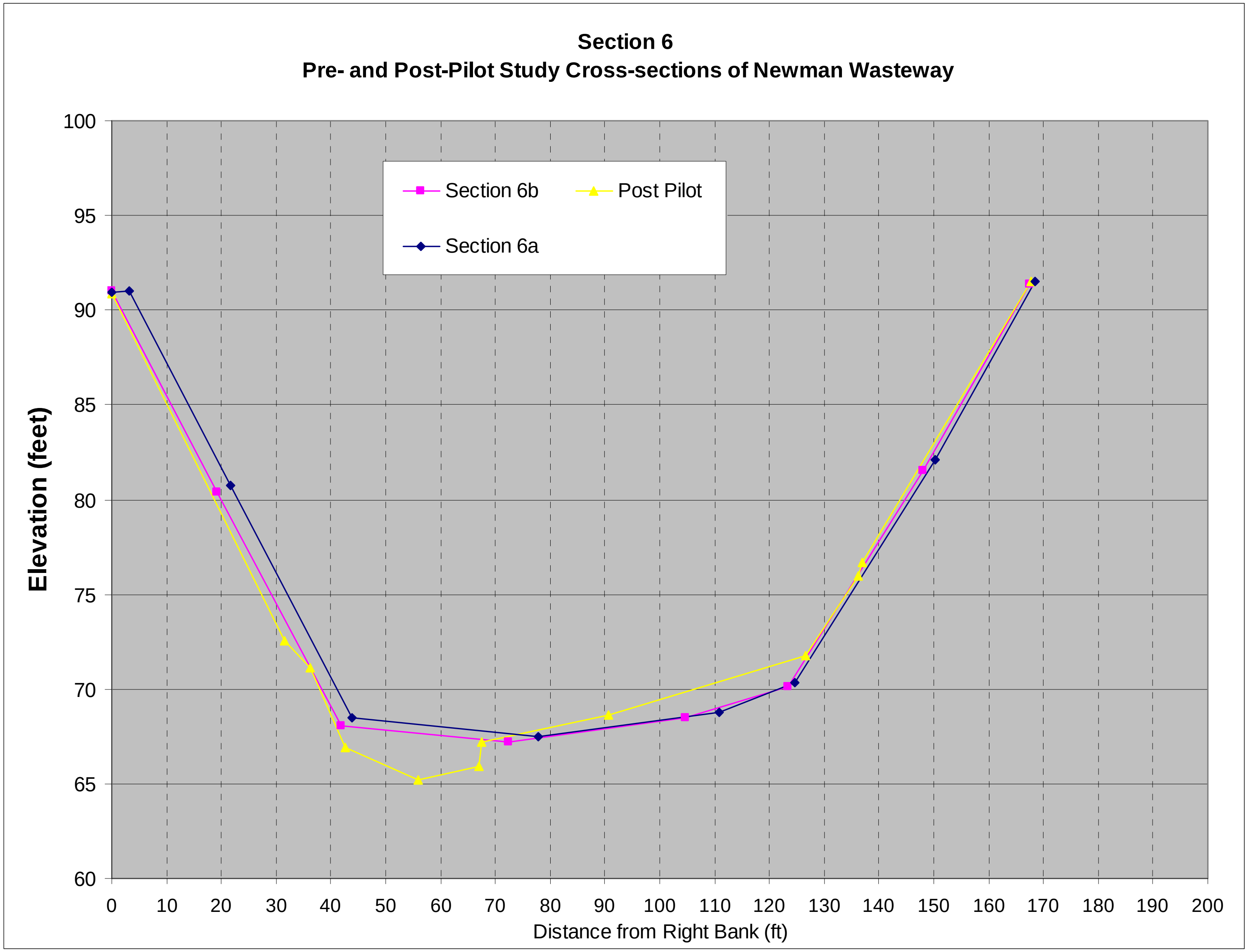

Figure E-7. Section 6: Pre- and Post–Pilot Study Cross Sections of Newman Wasteway

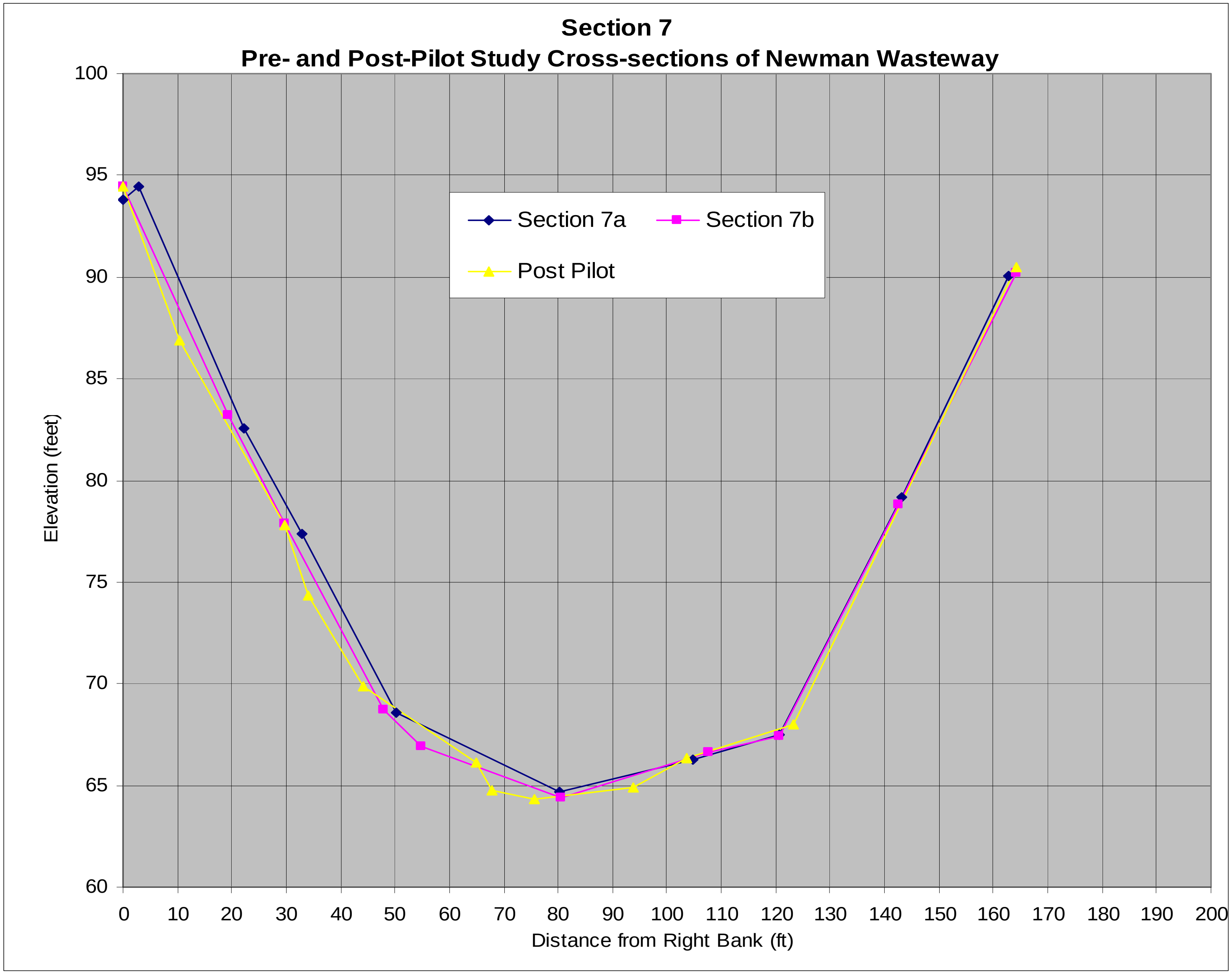

Figure E-8. Section 7: Pre- and Post–Pilot Study Cross Sections of Newman Wasteway

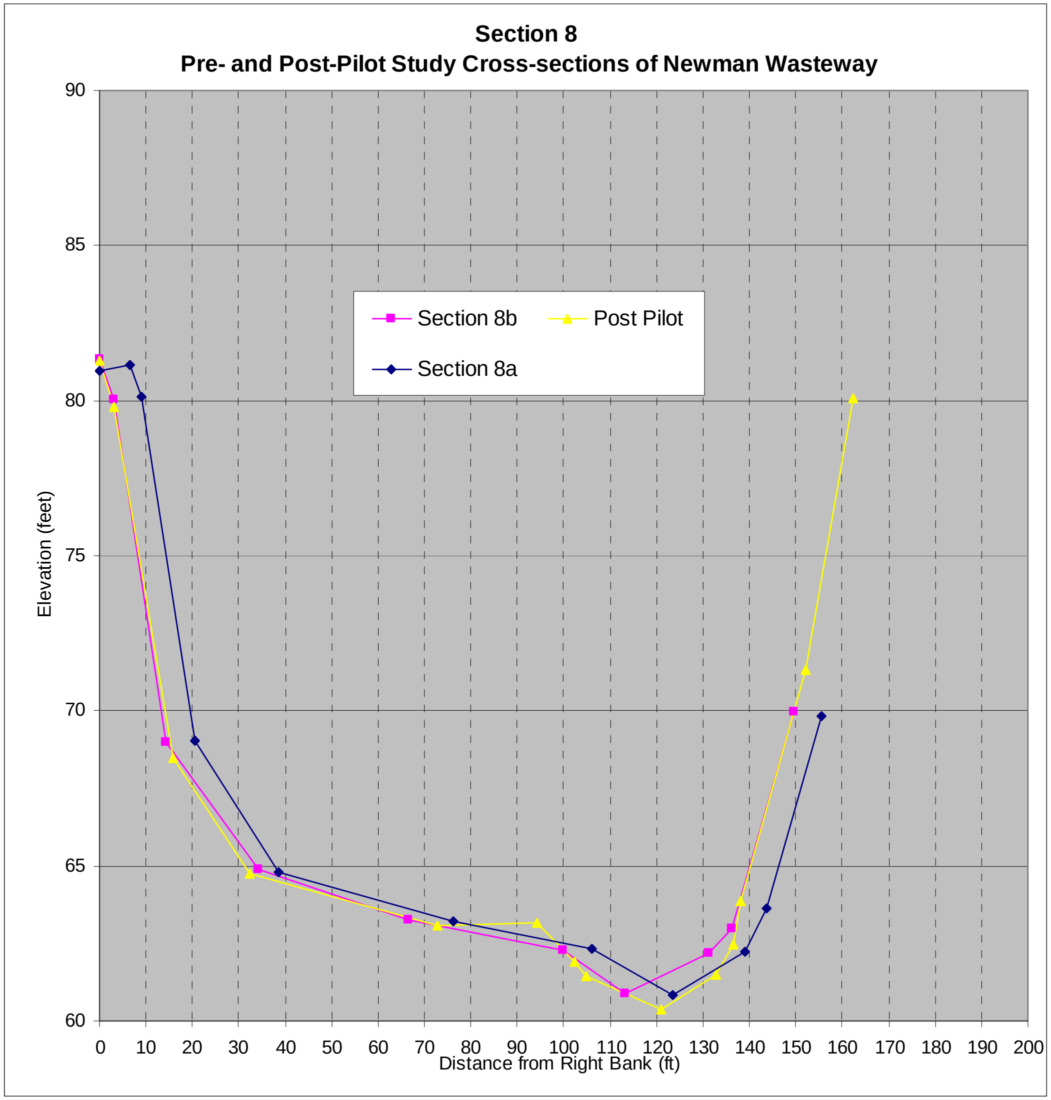

Figure E-9. Section 8: Pre- and Post–Pilot Study Cross Sections of Newman Wasteway

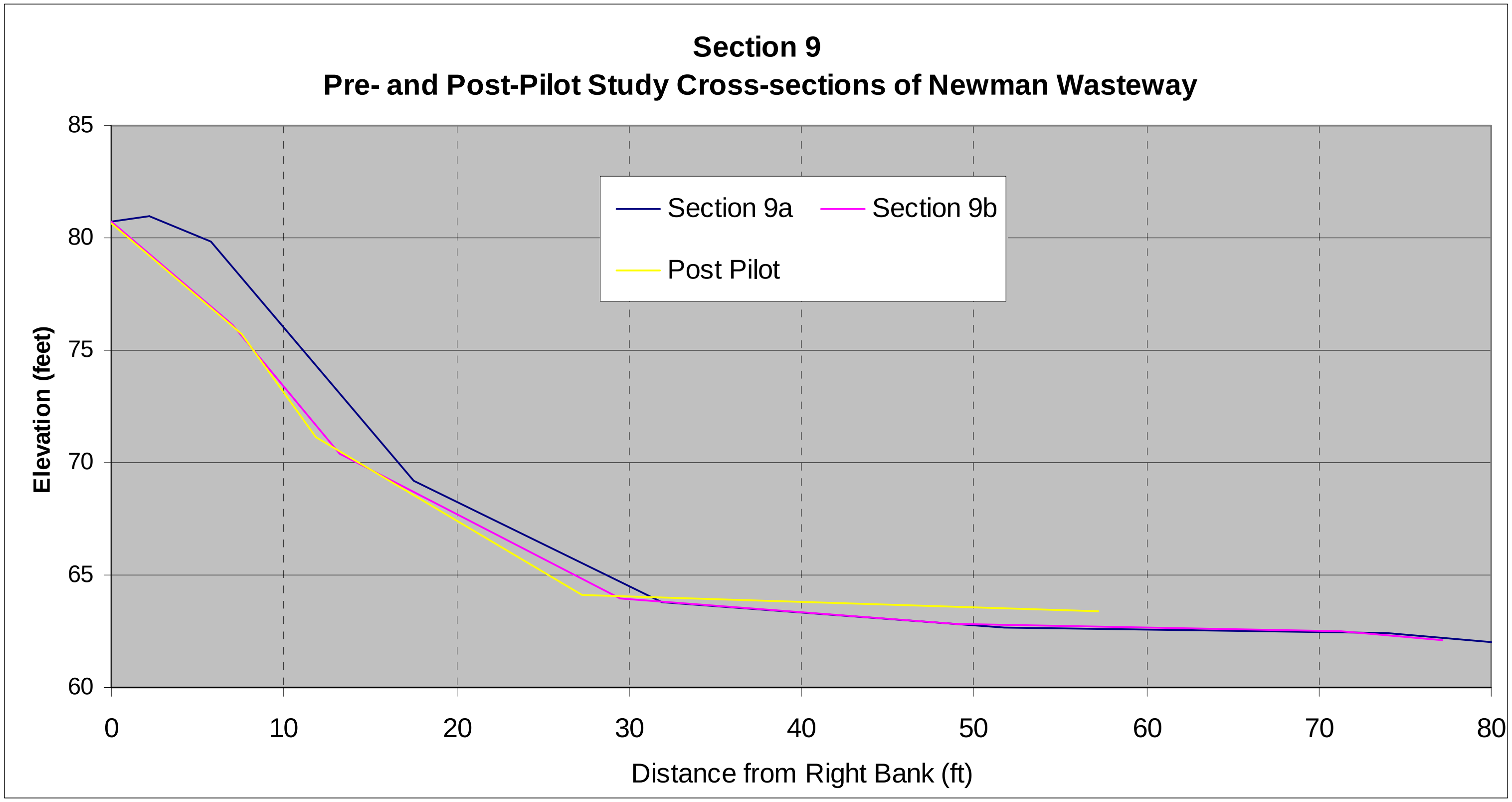

Figure E-10. Section 9: Pre- and Post–Pilot Study Cross Sections of Newman Wasteway

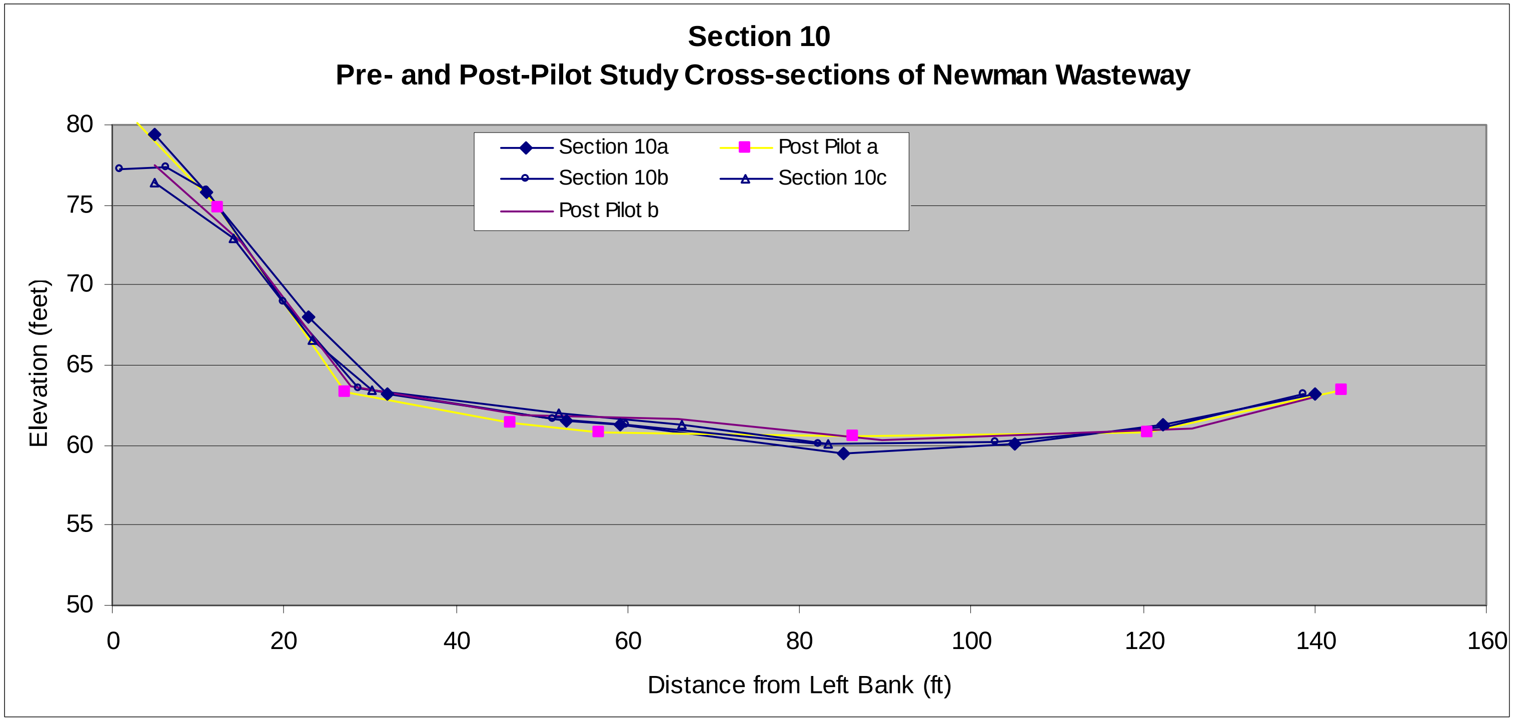

Figure E-11. Section 10: Pre- and Post–Pilot Study Cross Sections of Newman Wasteway

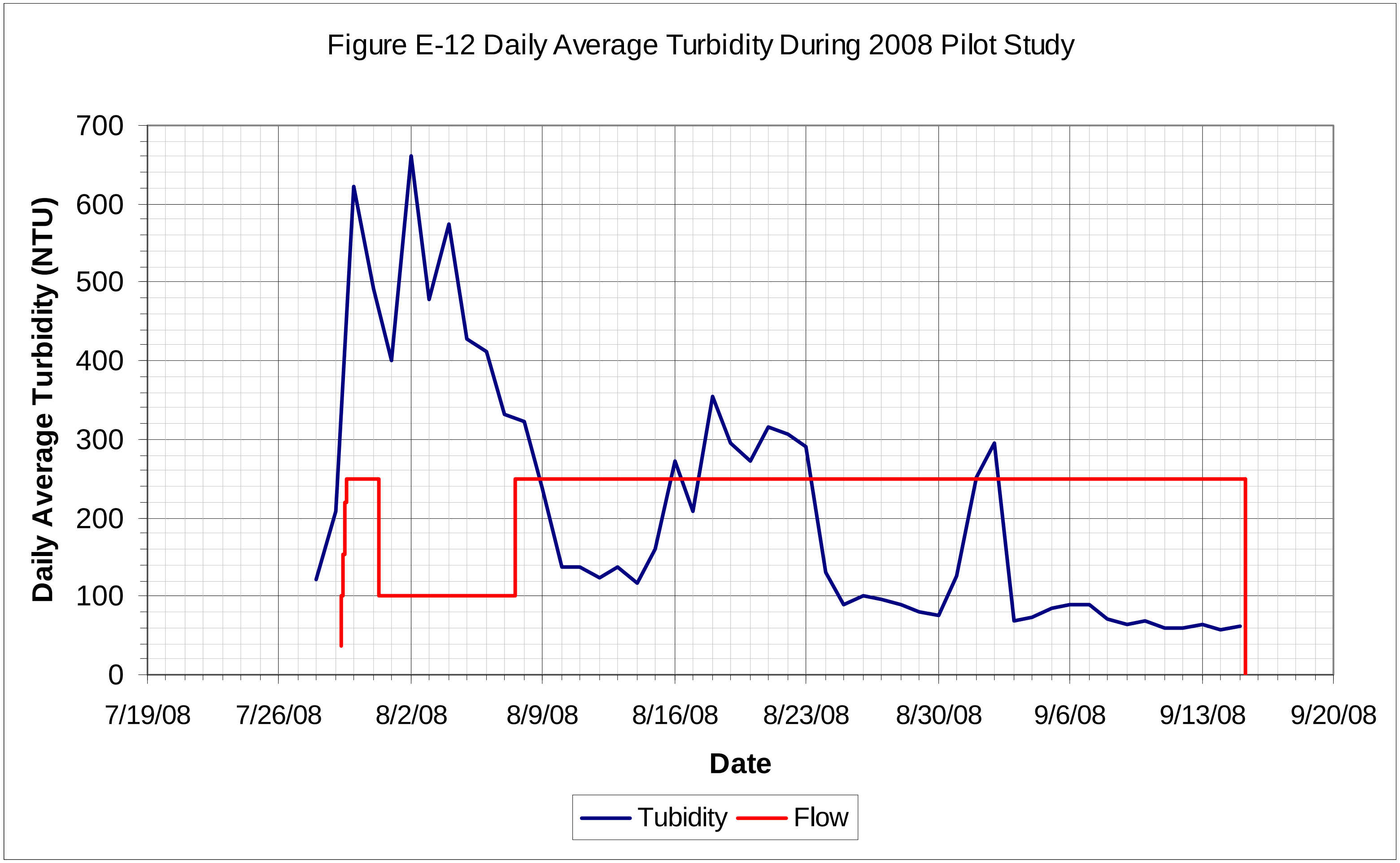

Figure E-12. Daily Average Turbidity During 2008 Pilot Study

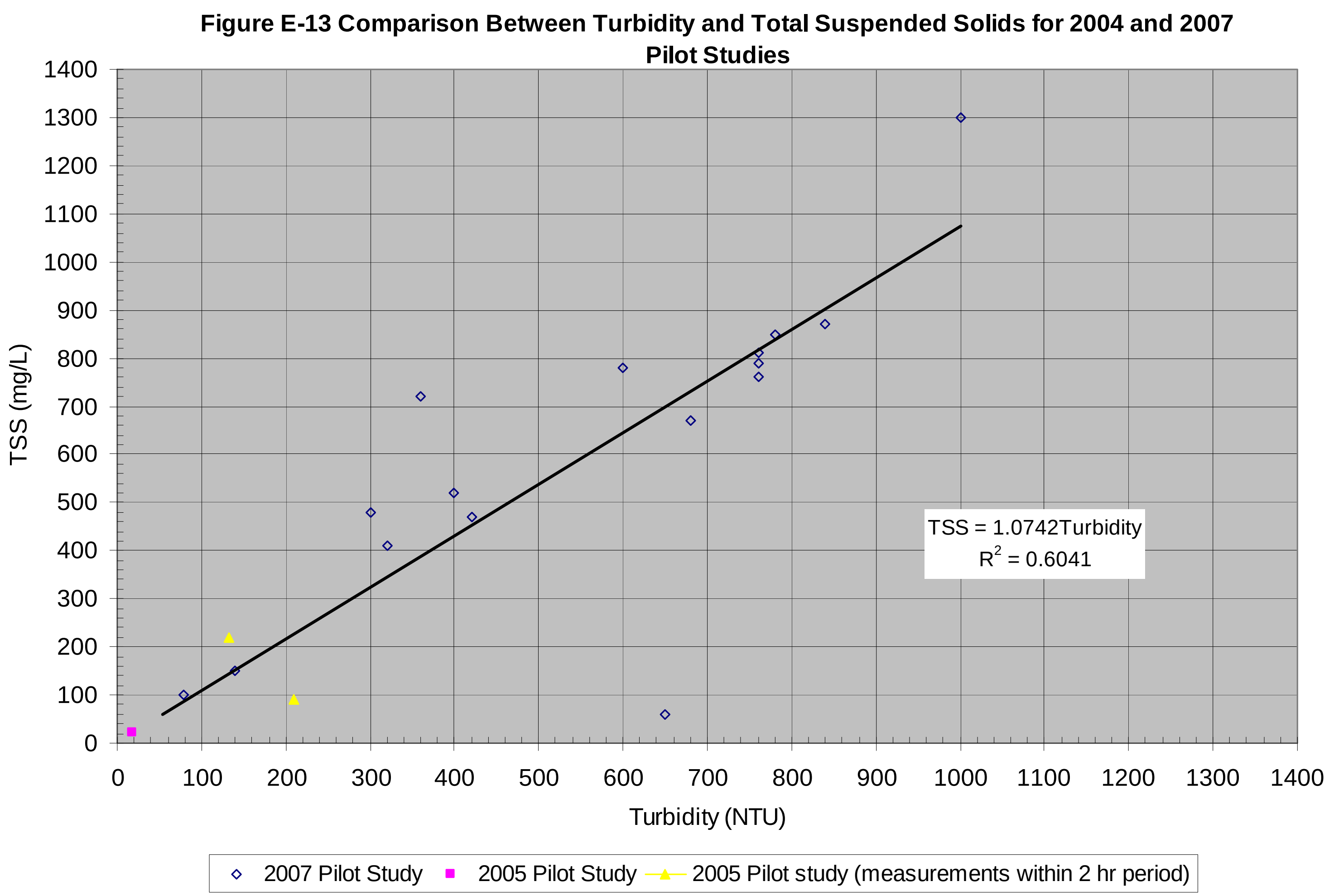

Figure E-13. Comparison Between Turbidity and Total Suspended Solids for 2004 and 2007 Pilot Studies