5. SUMMARY OF THE EXISTING CONDITIONS AND RECOMMENDED STRATEGY FOR BANK STABILIZATION AND CHANNEL CORRIDOR RESTORATION

5.1 EXISTING CONDITIONS

The existing conditions assessment has found that the Napa River in the project reach is severely incised below its historic floodplain. Downcutting is the result of many historic and ongoing activities including urbanization, removal of point bars and in-channel vegetation clearance for gravel extraction and to increase flood conveyance, levee construction, and downstream dredging.

As the Napa River bed has cut downward its banks have grown higher and steeper, become unstable, and have collapsed. In addition large flood flows that would previously have spread out onto the floodplain, dissipating erosive energy, are now confined and concentrated within a deep, narrow channel where they continue to cause accelerated erosion of both the streambed and banks. These two linked processes are causing accelerated erosion and the associated problems for landowners and the environment. Downcutting of the bed has converted a complex aquatic environment of riffles and pools into a simpler system dominated by long continuous pools with lower value to important native fish such as Chinook salmon and steelhead trout. Erosion of the banks generates large volumes of fine sediment that threatens to impair water quality and bury or embed spawning gravels. Analysis of successive channel profiles and resurvey of RCD cross-sections in the upper project reach (cross section 26190) shows that much of the downcutting is very recent, and potentially ongoing.

Currently channel management involves local bank stabilization of problem sites following erosion and bank collapse. Historically this has been achieved using building debris or rip rap (heavy rock armor), but more recently biotechnical techniques are being used. However, while the process of protecting the banks is solving the local symptom it is not addressing the underlying problem of channel confinement. Local bank stabilization is preventing the channel from widening and reaching a new stable equilibrium form, and is contributing to erosion problems elsewhere as the channel expends its excess energy on neighboring unprotected banks.

If the Napa River is not managed (i.e. no bank stabilization or channel repair and maintenance work is carried out) it will eventually recover naturally, though this process may take fifty to a hundred years, or longer. Unchecked, the river will erode its former banks until it has widened them to the point where it can create a new equilibrium channel and floodplain below the former floodplain terrace. At this point the river will be in a new equilibrium state, since high flows will again spill out of the new channel and dissipate erosive energy on the new floodplain. Bank erosion rates will then slow down to 'natural' rates, since the river will no longer have excess energy, as it currently does. However, this recovery process will take a long time, will occur at unpredictable times and to a certain extent in unpredictable locations, and will pose a landuse and management problem.

As a central part of our appraisal of current and future conditions we have carried out a geomorphic assessment of the project reaches. We have classified the channel using a modified version of Schumm's scheme for assessing disturbed river systems. This scheme classifies reaches based on their shape and geomorphic processes following channelization, with a series of stages ranging from most disturbed (Stage 3) to fully recovered (Stage 6). In essence the stages show how far away a reach is from the natural recovery condition described above.

Classification of the project reach reveals the following channel conditions:

Stage 1 Natural (pre disturbance condition) 0 feet (0%)

Stage 2 Constructed (artificial drainage channel) 0 feet (0%)

Stage 3 Incising (most in need of stabilization/restoration) 390 feet (2%)

Stage 4 Widening (next most degraded condition) 9,315 feet (44%)

Stage 5 Widening and forming terraces (least degraded but subject to bank erosion) 9,440 feet (45%)

Stage 6 New dynamic equilibrium (recovered but still potential for 'natural' erosion) 1,950 feet (9%)
(Total 21,095 feet of channel surveyed)

The distribution of reaches is shown in Figure 5.

5.2 PRIORITY SITES AND REACHES FOR CHANNEL STABILIZATION AND RESTORATION

PWA has worked with the RDRT, the Napa County Resource Conservation District (RCD), Napa County and Ellie Insley & Associates to develop a series of conceptual stabilization and restoration alternatives for reaches in each stage. The different conceptual alternatives present a spectrum of different approaches to achieve the goals of the RDS. At one end of the spectrum the alternatives work within the existing bankfull channel footprint (the area occupied by flow approximately once every year) and emphasize minimizing river channel migration onto adjacent land or riparian habitat. At the other end of the spectrum the conceptual alternatives expand beyond the current banktop footprint to emphasize developing a sustainable river corridor. (The footprints are shown in Figure 7). As the constraints and the severity of the problems vary from point to point, different conceptual alternatives are recommended for each location on the river. The conceptual alternatives are fully explained in Section 6, page 34.

We have identified and prioritized two types of situation – bank stabilization sites and restoration reaches.

1. Stabilization-only sites are local 'hot spots' where isolated bank sites are collapsing within reaches that are generally less degraded (for example where flows impinge on the outside of stream bends). Though local instability is related to wider problems in the river system, these sites are urgent priorities that could beneficially be stabilized in a shorter time scale than is feasible for the whole river. Stabilization would prevent loss of land and riparian corridor, and would reduce significant fine sediment inputs into the river that are contributing to loss of fish spawning habitat.

2. Reaches are large portions (typically 2,000-4,000 feet) of the river with similar physical characteristics, and within which consistent restoration or management strategies can be recommended.

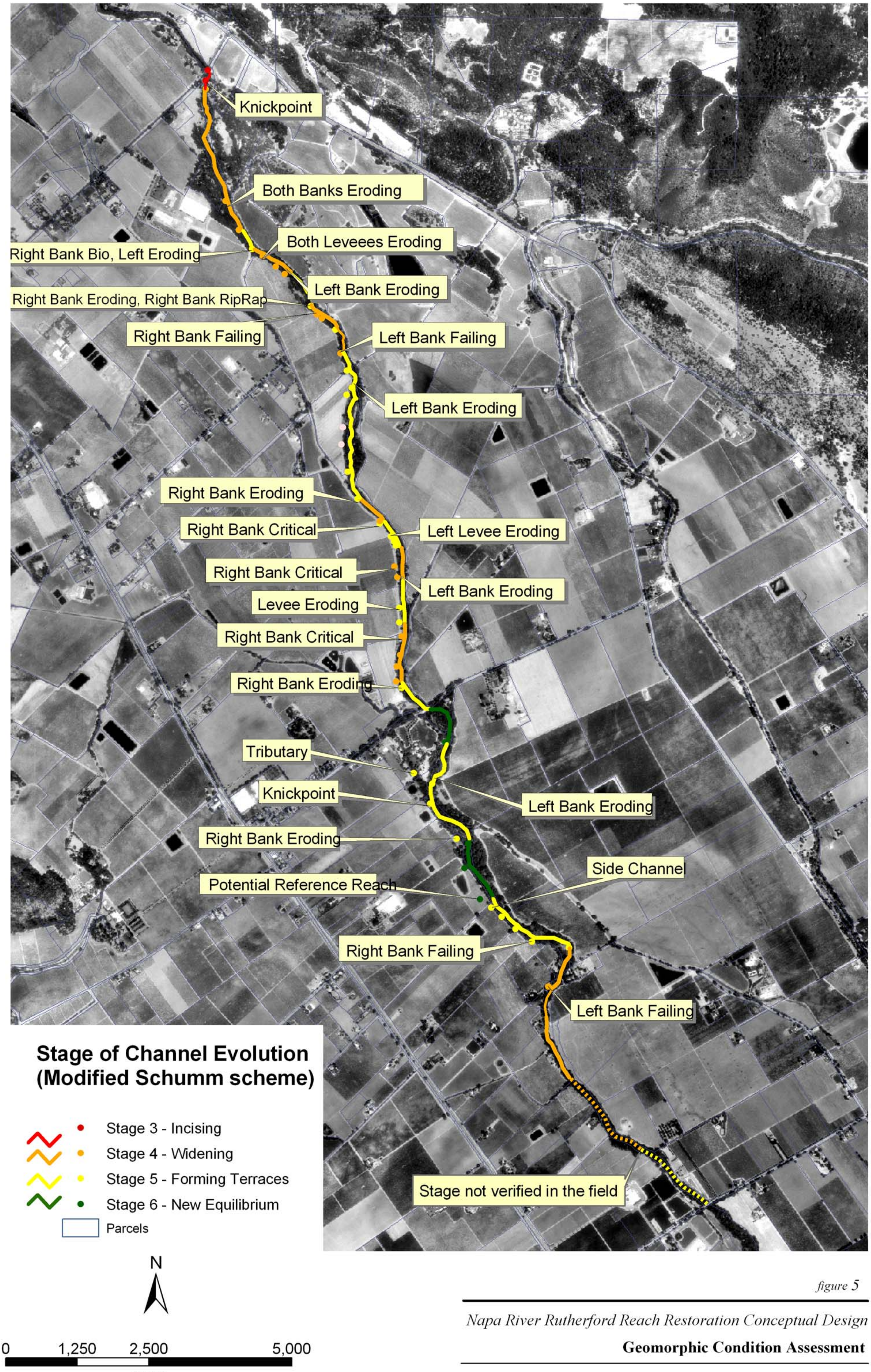
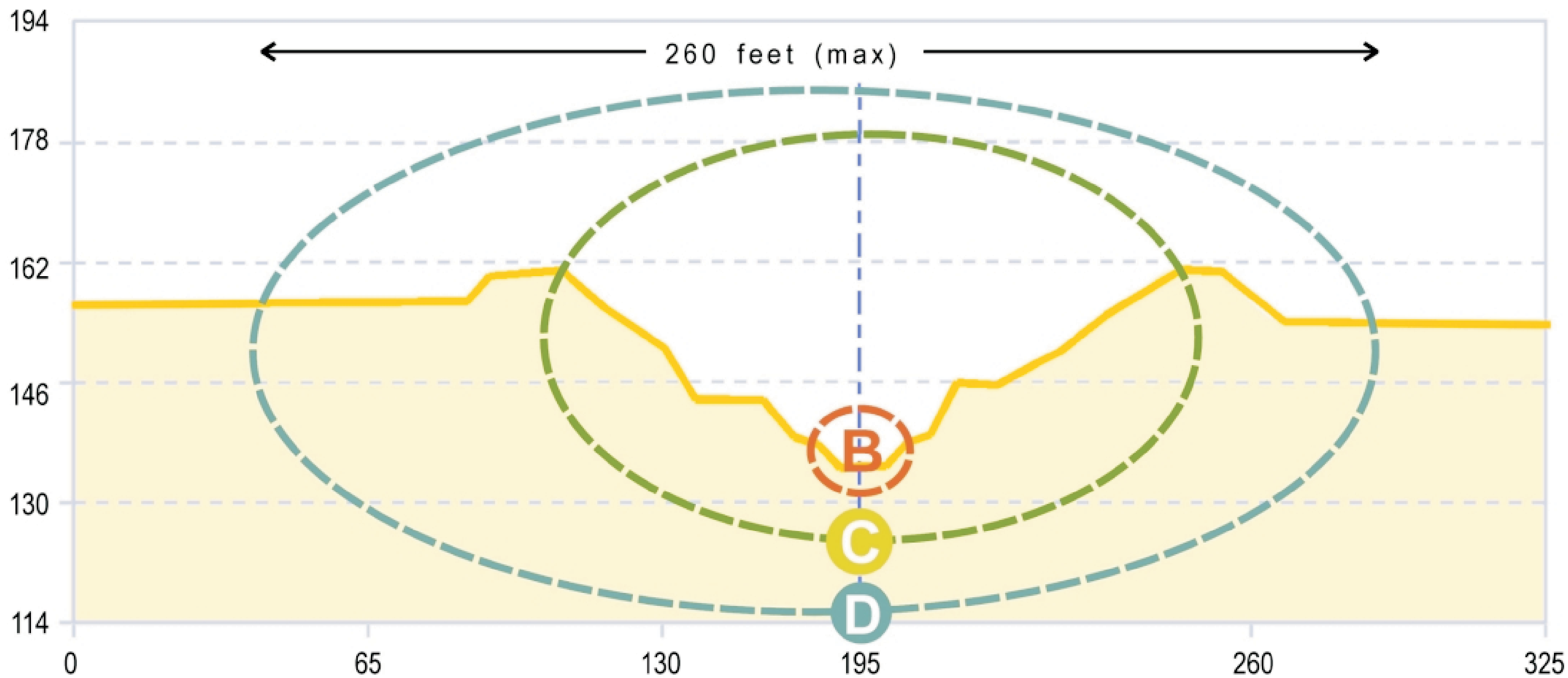


figure 5

Napa River Rutherford Reach Restoration Conceptual Design

Geomorphic Condition Assessment

Proj. # 1638



TYPICAL AREA OF ACTIVITY: **ALTERNATIVES** B, C, & D

figure 6

Explanation of the Restoration Approach Footprints

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PWA

5.2.1 <u>Priority Sites for Bank Stabilization</u>

Three sites have been identified where localized but severe bank slumping is currently taking place, and where stabilization and restoration is a high priority. These locations are indicated in red on Figure 10 and conditions are shown in Figure 7 to Figure 9. Note: Detailed stabilization plans will require additional hydraulic modeling.

Figure 7. Priority stabilization site 1 - Laird site

Laird property N38°27.082 W122°24.276 East (left) bank slumping; bank requires regrading to stable angle, revegetation and toe protection using biotechnical methods (e.g. large woody debris)

Figure 8. Priority stabilization site 2 – Sequoia Grove site

Sequoia Grove property N38°27.211 W122°24.337 West (right) bank slumping; bank requires regrading to stable angle, revegetation and construction of bendway vanes to deflect flow away from bank toe.

Figure 9. Priority stabilization site 3 - Quintessa site

Quintessa and Frogs Leap properties N38°28.902 W122°25.047 East bank slumping; pull back and regrade left bank, use root wads to stabilize west bank toe.