RECOVER LFT Validation Executive Summary

The purpose of this validation was to assess the effectiveness of the RECOVER LFT with regards to latent print development on metal items. Phase I of the validation focused on two metal types (brass and steel) with eccrine and sebaceous fingerprints under several conditions: specificity, sensitivity, aging, washing, use of bleach, and comparison to the normal processing sequence under highly controlled conditions. The specificity study resulted in 64% of donor samples having some degree of development. Development varied by metal type, brass outperformed steel, and matrix type, sebaceous outperformed eccrine. Similarly, the sensitivity study resulted in 63% of samples having some degree of development with the brass/sebaceous samples outperforming all other metal/matrix combinations from the first through the sixth touch in the depletion series. The recovery of aged samples study indicated that the quality of the prints tended to decline between one and six months of aging. The pre-washing portion of the study aimed to determine if it was better to pre-wash or not pre-wash the sample as part of the methodology. Best results were consistently achieved when samples were not pre-washed prior to processing with RECOVER. The recovery of fingermarks after exposure to bleach demonstrated that it was possible to develop prints of various ages on samples that had been subjected to household bleach. Results were inconsistent with regards to recovery rates/amount of time elapsed between deposition and bleach exposure, but there was again a clear correlation between metal/matrix type, with the brass/sebaceous combination giving the best results. The comparison between RECOVER and the traditional processing sequence (CAE, R6G) demonstrated that RECOVER prints had more grade 4 (very strong development) impressions than R6G, but the number of samples graded 2 and 3 was slightly more favorable for R6G. Comparing R6G to REC as the samples aged, revealed that the number of samples deemed suitable for comparison (grades 3 and 4) was equal to or greater for REC than R6G for the majority of the time variables. When metal type was taken into consideration, the traditional sequence performed better on steel samples, while RECOVER performed better on brass.

Phase II of the validation used the knowledge gained from the first phase to test the RECOVER on cartridges and cartridge cases handled in a semi-controlled manner. Effects of prewashing was explored on both fired and unfired cartridges for four metal types (aluminum, brass, nickel, and steel). Results indicated that it was best to not wash for both fired and not fired cartridges/cases. RECOVER results were slightly better for both fired and non-fired brass cartridges/cases. While non-brass samples (aluminum, nickel, and steel) did slightly better with traditional processing sequence.

Phase III incorporated all the information learned from the previous two phases and applied RECOVER to the pseudo-operational samples i.e., simulated case work. The first part of this phase examined the results of loading/unloading or loading/firing on cartridge cases (normal handling) on differing metal types (aluminum, brass, and nickel) in combination with aging (1 day, 1 week, 1 month). As expected, unfired performed better for all metal types than fired, with brass performing the best, followed by nickel, and then aluminum. An assortment of fired cartridge cases was collected from various gun ranges with unknown firing conditions and sample ages. The majority of these samples (~73%), were brass with the remainder being other metal types (aluminum, nickel, and steel). Of the 472 gun range samples processed, only 5.3% showed limited development and all of these were on brass samples. Lastly, a variety of brass and silver-colored thrift store items, with unknown handling, were processed with RECOVER. The brass items outperformed silver-colored items by ~13%.

All of the minimum thresholds (development of friction ridge detail on majority of donors, development of friction ridge detail on at least the first set in a depletion series, development of friction ridge detail on a majority of aged samples, development of friction detail equal to or better than the current ISPFS processing methods, and the reproducibility of the method) were met for the brass, whereas not all were met for the steel. Additionally, some of the desired outcomes were met. Developing ridge detail on items that have been wet, cleaned, or placed in bleach was accomplished for brass but was not met for steel. It was determined that brass could be fumed up to an hour without risk of over fuming, and that firearm headstamp evidence could be easily protected while processing cartridges/cases with RECOVER.

In summary, the best results can be expected with a brass/sebaceous combination and worst results with steel/eccrine combination. It is possible to recover prints from a majority of donors using the RECOVER. Prints with only a small amount of matrix may be recoverable. Aging the prints decreases quality of prints developed with RECOVER, so processing samples as soon as practical could increase results. While it was determined that it was best to not pre-wash items prior to processing, some high-quality prints were still able to be developed after doing so, which could allow for DNA swabbing followed by RECOVER processing. Likewise, it was demonstrated that it is possible to develop prints after being subjected to harsh cleaning techniques such as bleach. RECOVER gives better results on brass than the traditional sequence but did not outperform it on steel. Based on the findings of this validation it is recommended that RECOVER be incorporated into latent print processing for copper-based/brass items.