

CHAPTER 5 – FUTURE WIP DEVELOPMENT

With the completion of the first retaining wall inspection cycle in late 2008, attention is turning to continued development of the WIP to enhance future inspection cycles, follow through on stakeholder management needs of the current asset database, and provide for long-term program maintenance and data accessibility. A great deal was learned over the course of the WIP development and Cycle 1 implementation which directly impacts current and future NPS asset management efforts, as well as a broader audience within the U.S. transportation industry. The following highlights on-going work and recommendations to ensure program sustainability and incorporation of “lessons learned” from the Cycle 1 inventory.

Data Maintenance and Accessibility

Currently, inventoried wall data reside in several forms: (1) archived original hardcopy field forms; (2) scanned Adobe .pdf files for each original field form; (3) the WIP Microsoft Access-based user-friendly database, currently resident on the CFL project server system; and, (4) a secure copy of all data fields within a searchable Oracle platform database. Quality control (QC) checks were integrated within the original Access WIP database to ensure data integrity to the extent possible when transferring field form information to electronic format. An independent quality assurance (QA) sampling of the field forms, Access database and Oracle database has also been completed to identify and correct data transcription errors. The specific data items transmitted to the NPS FMSS asset management system and to the RIP database has also provided an additional opportunity for QC/QA-level data checks. The Cycle 1 WIP data are now securely archived and backed up, the data integrity has been shown to be high via the QC/QA efforts to date, and write accessibility is controlled through the Database Administrator.

Data accessibility is currently provided via canned reports available on the CFLHD web site, read-only database searches via internal user access to the server-based WIP database, or ad hoc requests of the Database Administrator. Efforts are currently underway within CFLHD to develop a division-wide geographical information system (GIS) for the management of project and roadway information. The WIP database information will be directly linked to each park within this developing system. Although user access to the WIP database external to FLH has been developed and can be provided via a firewalled external server system, access to date is cumbersome and yet to be used. New developments in secure information sharing may make future inspection cycles more readily accessible to outside parties. For now, the avenues for accessing the data appear to be suitable for the needs of the NPS and internal FLH users – though this will certainly change as structure and geotechnical asset management programs develop nationwide.

Cost Guide Improvement

A significant challenge of the Cycle 1 inventory involved the development of meaningful cost estimates for various levels of wall repair and total wall replacement. Because of the historic nature of the vast majority of wall structures in the parks inventoried, cost data on specialized repair options was limited, including such things as stone masonry work, repointing, foundation underpinning, etc. As a result, the current Cost Guide provides an agglomeration of historical pay item unit pricing, rolled up specialized repair item pricing, and total wall replacement estimates based on an assortment of documented and internally-developed pricing sources (e.g.,

specific FLH projects, regional pay item bid tabs, RS Means pricing data, FHWA/NHI published resources). At the completion of the Cycle 1 inventory, it was determined that very few of the cost items listed in the WIP Cost Guide were actually used in developing work orders. This fact was likely a combination of simply not needing a large range of cost items coupled with cost estimates that did not adequately include all of the tasks required.

To enhance future estimation of wall repair and replacement costs, the current database should be queried to determine what and how often specific pay items are being used to develop work orders and if the work orders submitted are sufficient to meet the program needs of the NPS FMSS asset management system. In the coming years, and prior to initiating a second inspection cycle, actual costs for recommended wall repairs and wall replacements from Cycle 1 inspections should be evaluated to determine the accuracy of the original work order cost estimates.

Updated Training Program

In order to best benefit from the enormous technical and program management educational opportunities afforded by the WIP, it was decided to deliver the Cycle 1 inspection program primarily via staff within the three FLH division field offices. Although this approach to program delivery paid big dividends in terms of technical staff at the three field offices getting to work with one another and become intimately familiar with the cross-functional asset issues at the major parks across the U.S., the program seriously strained available technical resources during summer construction months, often impacting forest highway project delivery. As a result, the recently developed Traffic Barrier/Guardrail Inventory Program (GIP), built on the experiences of the WIP, opted to deliver the requested NPS guardrail/guardwall inventory across selected major parks with contracted inspection. This approach required significant control by FLH program management over contractor training and inventory QC/QA practices. The lessons learned from the GIP contracting effort should directly translate to future WIP inspections should the program grow substantially beyond the current 32 park asset database. If WIP Cycle 2 inspections are confined to the existing park inventory, and assuming that only a sampling of the current already-located wall inventory would require visual re-inspection, internal staff would once again be the preferred inspection resource.

Coordination with RIP, BIP and GIP

At present, WIP wall information is provided to the Road Inventory Program (RIP) to update the features tables in the RIP inventory report. Features, including not only retaining wall structures but also such things as signs, guardrails, sidewalks, culverts, buildings, etc., are only listed by type and milepoint and are not shown on the published RIP route maps. The data are, however, readily available and can be uploaded to any number of GIS applications.

Conversely, WIP wall data are not currently provided to the BIP inventory as bridges are also compiled under the RIP features listing per park. However, BIP could directly benefit from the WIP inventory data, and vice versa, to ensure that a clear distinction is made between bridge structure walls evaluated under BIP and bridge-related walls evaluated under WIP. Aside from providing data to the RIP features table, no coordinated effort has been undertaken thus far to clarify the inspection roles of each asset group (including the GIP inventory). Broader guidance is needed across the entire FLH asset management program to clarify roles and responsibilities

and ensure that data formats and management systems are comprehensive, robust, secure, and aligned with partner agency needs.

With regards to the technical requirements for merging WIP data within the parent RIP inventory, as RIP moves into successive data collection cycles milepoint references can change since the Automatic Road Analyzer (ARAN) surveys are not milepoint repeatable. The current Cycle 4 RIP survey is attempting to standardize the milepoint reference for all future surveys to avoid accumulating conversion errors throughout successive surveys. This requires that the current WIP inventory milepoint references, collected per RIP Cycle 3 survey data, need to be updated to accurately locate wall features within the RIP Cycle 4 milepoint reference system. This work is currently underway, but is expected to take one or more years to complete as resources become available in the RIP program to convert tabled park features to Cycle 4 milepoints.

Culvert Inventory Issues

At the time of the WIP Cycle 1 inventory, the NPS was in the process of establishing guidelines for culvert inspections conducted by park maintenance personnel. These draft guidelines primarily focused on the ability of the culvert to convey water as originally designed, and did not directly relate culvert performance to roadway performance or require culverts to be located per the RIP milepoint reference system. Therefore, and considering that many culverts have associated headwall/wingwall structures supporting overlying roadway embankments, it became necessary to include qualifying culvert headwall/wingwall structures in the WIP inventory (per the acceptance criteria in Chapter 3). As a result, culvert structures comprise a substantial percentage of the total wall inventory. Moving forward, and in an effort to simplify the WIP wall acceptance criteria and wall definitions, it is recommended that a separate culvert inventory be developed to manage this critical asset, tying the data to the RIP milepoint reference system. Recent comprehensive culvert inspection guideline developments within FLH should provide a good place to begin developing a separate and well-defined culvert asset management program for the NPS.

Realizing the Intent of “Life Cycle” Asset Management

Wall inventory and assessment information has been provided to the NPS FMSS asset management systems resident at each of the inventoried parks. The information has been used to schedule maintenance activities and minor wall repairs, as well as begin the process of programming complete wall replacement projects. Based on just one inspection cycle, the parks are only able to simply address burning needs with respect to retaining structure performance, having no long term performance data from which to establish life-cycle maintenance-repair-replace strategies. The unique nature of the database (i.e., high percentage of 50+year-old stone masonry walls), coupled with limited information on wall age and periodic maintenance/repair expenditures, makes it nearly impossible to “back-calculate” a life cycle curve per family of wall types within the database. Realizing true life cycle asset management for earth retaining structures will require a commitment to regularly inspect a portion of the database on a scheduled basis and to retain detailed annual maintenance expense records for each structure. Earth retaining structures, the majority of which are well over 50 years old, account for well over \$400M in assets within just those parks included in the current WIP inventory (possibly greater than \$1B agency-wide), making this a critical asset to effectively manage in the decades to come.

