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HISTORIC BUILDINGS AND CONSTRUCTION: A COMPARATIVE ANALYSIS OF THE DESIGN-BID-BUILD AND DESIGN-BUILD PROCESSES

Megan W. Tooker, Kristen E. Mt. Joy, Nicholas M. Patrick, and Adam D. Smith / U.S. Army Engineer Research and Development Center (ERDC)
Construction Engineering Research Laboratory (CERL) and the Texas Military Department

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September 2023

Construction Engineering
Research Laboratory

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Abstract

This report is focused on the Design-Build (DB) versus Design-Bid-Build (DBB) construction processes and how they relate to historic preservation. The U.S. Congress codified the National Historic Preservation Act of 1966 (NHPA), the nation's most effective cultural resources legislation to date, to provide guidelines and requirements for preserving tangible elements of our nation's past. Contained within this piece of legislation are requirements for federal agencies to address their cultural resources, defined as any prehistoric or historic district, site, building, structure, or object (NHPA Sections 110 and 106). The goal of this report is to improve the integration of culture resource requirements such as Section 106 NHPA into construction management systems. Through interviews, site visits and case studies, this report offers lessons learned and recommendations for successful preservation with the goal of eliminating costly delays in the construction process due to Section 106. The key to successful construction projects, both DB and DBB, is to have cultural resource managers (CRMs) involved in the process early and that involvement and consultation should be ongoing throughout the process.

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Preface

This study was funded by and conducted for the Department of Defense Legacy Resource Management Program (Legacy Program) under Project #16-787, "Historic Buildings and Construction: A Comparative Analysis of the Design-Bid-Build and Design-Bid Processes." Administrative and technical oversight was provided by Legacy Program Director, Elizabeth Galli-Noble.

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Unit Conversion Factors

Multiply	By	To Obtain
acres	4,046.873	square meters
degrees (angle)	0.01745329	radians
feet	0.3048	meters
inches	0.0254	meters
miles (U.S. statute)	1,609.347	meters
square feet	0.09290304	square meters

1 Introduction

1.1 Background

The U.S. Congress codified the National Historic Preservation Act of 1966 (NHPA), the nation's most effective cultural resources legislation to date, to provide guidelines and requirements for preserving tangible elements of our nation's past. This preservation was done primarily through creation of the National Register of Historic Places (NRHP). Contained within this piece of legislation are requirements for federal agencies to address their cultural resources, defined as any prehistoric or historic district, site, building, structure, or object (NHPA Sections 110 and 106). Section 110 requires federal agencies to inventory and evaluate their cultural resources. Section 106 requires the determination of effect of federal undertakings on properties deemed eligible or potentially eligible for the NRHP.

With a vast complex of installations and facilities to maintain and develop, the DoD must efficiently manage projects in a construction market rapidly changing due to stricter requirements in energy efficiency, force protection, and technological infrastructure. To reduce costs, timelines and avoid change orders, DoD facilities are increasingly turning to the use of the Design-Build (DB) project delivery method as an alternative to the traditional Design-Bid-Build (DBB) method employed in large construction projects.

The DBB method is often referred to as the "traditional" method. It is based on an agency or property owner contracting separately for design and construction services. In this three-phase method, the agency contracts with an architect or engineer to complete 100 % design documents and technical specifications, which then become the bid documents upon which general contractors (GC)s will submit cost proposals for the actual project execution.[1] Advantages to this approach are the agency/owner can exercise more control over design before construction, the design team becomes an advocate in working for agency in interactions with GCs, and greater competition for the project with a likelihood of lower costs. On the flip side, because DBB generally awards lowest bids for the construction

[1] James David Fernane, *Comparison of Design-Build and Design-Bid-Build Performance of Public University Projects* (Reno, NV: University of Nevada, 2011).

phase, there is a high probability of change orders, both in terms of cost and timeline extensions. In addition, the timeline is already extended in the DBB process due to the need to complete 100% of the design before soliciting proposals for construction. In contrast, the DB construction delivery method is a process wherein one contract is established to cover the design and construction phases. It is sometimes referred to as a "Master Builder" concept and is arguably the older of the construction delivery methods.[2] This method focuses on one point of contact, the DB entity, resulting in reduced risks and lower costs which have made this delivery method increasingly popular in the public sector as competition for fiscal resources increases.

Studies like Penn State University's 1998 analysis of project delivery methods that show DB projects are on average completed 33.5 % faster and at a unit cost 6.1% lower are appealing to agencies like the DoD.[3] Criticisms of DB argue that while some risks are reduced, there is an increase in other risks, particularly for complex projects. The DB process limits competitive bidding, reduces owner control in the design and construction quality as the designers and GCs are in essence united in their approaches, and can drive costs up since changes after construction begins becomes costly.[4] In particular, poorly prepared performance specifications used to solicit DB proposals can result in a myriad of problems, as evidenced by the Belmont Learning Center project in Los Angeles. In this instance, environmental issues, specifically methane and hydrogen sulfide vapors in the ground as site sits on an old oil field, were not addressed in the course of the DB process for construction, resulting in significant time delays, cost overruns, and public distrust and outrage.[5] While no construction delivery method can be considered foolproof, the advantages in the DB method in the reduced costs and time schedules have resulted in DoD entities increasingly turning to this mechanism for projects. However, as evidenced by the Belmont Learning Center example, the complexity of a project, including

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[2] Robert Frank Cushman and Michael C. Loulakis, *Design-Build Contracting Handbook* (Aspen: Aspen Publishers, 2001).

[3] Mark Konchar and Victor Sanvido, "Comparisons of United States Project Delivery Systems" in *Journal of Construction, Engineering, and Management*, 124, no. 6, 1999.

[4] Steve Cooley, *Final District Attorney of Los Angeles Report on Belmont Learning Center* (Los Angeles, CA: Los Angeles County District Attorney's Office, 2003); Fernane, *Comparison of DB and DBB*.

[5] Cooley, *Report on Belmont Learning Center*.

internal and external variables, may not result in a best fit when it comes to the DB process.

One size fit all is rarely the case when it comes to construction projects and nowhere is this cliché more accurate than when dealing with historic assets. The stakes are driven higher in these projects by the greater regulatory requirements imposed when dealing with rehabilitations or new construction within historic buildings, districts, or landscapes. Not only do these projects initiate a regulatory requirement for consultation under Section 106 of the NHPA, but they may also necessitate the addition of skilled professionals with historic experience to all aspects of the project, from the design team to the sub-contractors hired for masonry, window and door repair, foundation work, etc.

It is important to examine the DB and DBB project delivery methods and what happens when Section 106 of the NHPA is triggered. The initiation of NHPA regulatory requirements can happen in a variety of ways. A project can involve the rehabilitation of a building that has been determined eligible for protection under NHPA (or will need evaluation for eligibility). New construction triggers NHPA coordination when it is occurring within an existing NRHP historic district or landscape or is causing ground disturbance in areas with known or unknown buried cultural resources. In any of these situations, additional historic preservation regulations may also be triggered, including Native American Graves Protection and Repatriation Act (NAGPRA) or Archaeological Resources Protection Act (ARPA). As a result, construction planning and programming needs to be cognizant of the manner in how the preservation piece is integrated within the project delivery methods available to them.

1.2 Objective

This report is focused on the DB versus DBB construction processes as they relate to historic preservation. The goal of this report is to improve the integration of culture resource requirements such as Section 106 NHPA into construction management systems. This report will compare the analysis of the DB and DBB construction delivery systems based on prior projects within the DoD on historic buildings. This analysis and lessons learned will benefit Cultural Resource Managers (CRMs), other military personnel, and construction related staff by providing a clear understanding of both construction delivery systems with practical guidance on how to make informed decisions and ensure best practices in each

process. Special attention is made to explain the best ways to avoid adverse effects to historic properties and implement efficient and successful Section 106 consultations in both construction processes.

1.3 Approach

This project researched and analyzed both construction delivery methods from a historic preservation perspective. Research in Chapter 2 includes background on the history of the preservation construction process, the evolution of the DBB and DB construction management systems, and how these construction delivery methods are implemented within the DoD. This chapter is based on a master's thesis, written by Mr. Nicholas Patrick for the University of Georgia in 2013. At the time, this thesis was the only specific reference to a study on historic preservation in project delivery methods. In this thesis, Mr. Patrick does an in-depth analysis of two Federal agency historic preservation projects he was involved with as a project team member. In Chapter 3, details of site visits made to several installations across DoD and documentation of the DBB and DB construction processes within their agency and installations. In Chapter 4, in-depth case studies were provided for the two construction methods as well as a case study detailing construction and archaeological resources. Lastly, the lessons learned from the site visits, case studies and research are provided, and recommendations made to improve the processes at the installation, regional, and headquarters levels of command.

1.4 Research Personnel

This project was conducted by ERDC-CERL research personnel: Adam Smith (MArch), with 25 years of experience in military architectural history; Megan Tooker (M Landscape Arch), with 25 years of experience in military landscape architectural history; and Kristen Mt. Joy (MA Anthropology, Register of Professional Archaeologists), with 18 years of military cultural resources management experience. With 20 years in construction spanning residential to heavy commercial, from rental property management to conservation of memorials on the National Mall, Nicholas Patrick's career is diverse and extensive. His interest in project delivery systems started while working in DC for a conservation firm and finishing his graduate thesis. His on-the-job exposure to DB led to questions about how contract professionals choose project delivery systems. Kristen Mt. Joy and Chantal McKenzie, former Architectural Historian at Texas Military Department, read his thesis and thought it would form a useful basis

for comparing DoD construction processes related to preservation projects. Mr. Patrick has graduated from the University of Georgia and is working in the private sector.

2 Understanding Construction Process Delivery Method and Historic Preservation

2.1 Introduction

2.1.1 Background

It is widely accepted that historic buildings provide a tangible connection to the past and contribute to a community's identity and stability, allowing users and visitors to experience the social, economic, and aesthetic value of a period while providing sociological and emotional connections to communities. Historic structures may represent the highest of architectural achievements and extraordinary techniques or show an economy of scale and function related to the constraints of local geography, material availability, and various cultural norms and styles. Why some structures come to be significant and worthy of preservation relates to a host of criteria ranging from scarcity of a particular style or type, associations with significant events or persons, or its relationship within a broader landscape or geographic district. To protect such historic structures, the United States Secretary of the Interior codified preservation standards starting in the 1960s with regular updates and new regulations to address new concerns, such as Cold War era properties. Using the current regulatory framework, an assessment of a structure should be completed as a basis for determining 'historic significance and integrity.' Defining a structure as "historic" under the NHPA influences its management and upkeep from a facilities management perspective. Maintaining and enhancing our critical historic resources requires strategies unique and as varied as the resource itself. Tackling that challenge requires a team approach which recognizes that the concept of preservation must permeate all aspects of a project undertaking, large or small.

2.1.2 Project Delivery Systems

In the world of construction, historic preservation is generally one small variable in a large formula of technical theories, methods, and considerations. Structural, mechanical, plumbing, electrical, carpentry, masonry, are just a few of the specialties comprising a larger scale construction project. To order and manage such a large crowd of specialties, the construction industry has developed project delivery systems to monitor and

complete a project. These project delivery systems are well established, generally standardized, and extensively analyzed. However, little research exists regarding project delivery systems and their effectiveness in the context of the additional variables related to preservation construction.

In the construction industry, the most common types of project delivery systems are DB, DBB, Construction Manager-At-Risk, Integrated Project Delivery and Design-Build-Operate/Maintain.[6] The owner or developer determines the project delivery system prior to the release of Request for Proposals (RFP)s, Invitations to Bid and contract documents. Once the project is awarded, client representatives, architects/engineers (A/E), construction managers, GCs, and sub-contractors agree to follow the prescribed project delivery system during design and construction phases by signing the contract. Despite the unique characteristics and challenges encountered in preservation projects, project delivery system options are the same as new construction. In the context of military construction, the choice of project delivery system may also be tied to issues related to funding and contracting mechanisms. Below is a brief summary of each project delivery system.

Design-Build (DB) – A project delivery method that combines architectural and engineering design services with construction performance under one contract.

Design-Bid-Build (DBB) – The traditional U.S. project delivery method, which customarily involves three sequential project phases: design, procurement, and construction. The owner holds multiple contracts with service and trade subcontractors.

Construction Management at Risk – A project delivery method in which the construction manager acts as a consultant to the owner in the development and design phases but assumes the risk for construction performance as the equivalent of a GC holding all trade subcontracts during the construction phase. This delivery

[6] The Construction Management Association of America, "An Owners Guide to Project Delivery Methods," cmaanet.org, http://cmaanet.org/files/Owners%20Guide%20to%20Project%20Delivery%20Methods%20Final.pdf (accessed October 20, 2016).

method is also known as Construction Manager/General Contractor.

Integrated Project Delivery – A recently developed project delivery method that contractually requires collaboration among the primary parties – owner, designer, and builder – so that the risk, responsibility, and liability for project delivery are collectively managed and appropriately shared.

Design-Build-Operate/Maintain – Another recently developed project delivery method that follows DB model during design and construction phases. After the building is complete and occupied, the DB contractor is responsible for building operations and maintenance for the duration of the contract.

2.1.3 Comparing Design-Build and Design-Bid-Build in preservation construction

Because the latter three project delivery systems are relatively new and less utilized in military construction, it is useful to focus comparison most common project delivery systems: DB and DBB specifically within the context of preservation construction. Despite the complexity of choosing and implementing project delivery systems, the difference between DB and DBB is simple—one contract versus two contracts. Owners hold one contract in DB projects that covers design and construction phases. Owners hold two contracts in DBB projects—one with design team and one with the construction contractor. Traditionally in DBB, the design team is responsible for design, administration of the contract, and the DBB construction contractor supplies materials, completes construction, and potentially maintains the facility. Since the creation of formal construction management in the 1960s, DBB has been the most common project delivery system.[7] Recently, "DB has grown in popularity, and is seen by some as a solution for addressing the limitations of other methods."[8]

While some may argue that historic preservation by its nature should not be overly efficient in time and resources, as public agencies, military

[7] Miklos Hajddu, Network Scheduling Techniques for Construction Project Management (Dordrecht: Kluwer Academic Publishers, Netherlands, 1997), 13.

[8] The Construction Management Association of America, "An Owners Guide to Project Delivery Methods."

services must be focused on careful expenditure of funds and time when dealing with taxpayer dollars and mission readiness. Efficiency, of course, can be measured in many ways, including can be measured in time, resources (costs), and technical performance of specifications (quality).[9] In a perfect world, efficiency is maximized across all measures to culminate in a well-designed, properly preserved, secure, easily maintained, and energy-efficient product. For publicly funded projects, it is critical to strive for this perfection in project execution, with the greatest emphasis usually placed on efficiency in costs and timelines. As will be discussed in the subsequent sections, balancing preservation regulatory coordination along with methodology and practices can prove challenging, particularly for specific construction delivery methods.

2.2 Historic preservation in the United States

2.2.1 Why preserve?

Preservation theory stems from an acceptance that cultural resources, including buildings, are 'worth' saving. According to the National Trust for Historic Preservation, there are six reasons to save old buildings:[10]

1. **Old buildings have intrinsic value.** Old buildings tend to be built to higher standards with rare materials.
2. **Unknown resources are lost when historic buildings are demolished.** Historic designs, rare materials, and superb craftsmanship can be lost when a building is demolished.
3. **Old buildings contribute to economic development.** Small businesses and start-ups thrive in old buildings because they are typically more affordable spaces.
4. **Old buildings attract people.** The aesthetics, materials, design, and variety of historic buildings resonate with people.
5. **Old buildings represent a community's culture and complexity.** A community needs old buildings to maintain a sense of permanency and heritage.

[9] W. Fazar, "Program Evaluation and Review Technique," *The American Statistician*, Vol. 13, No. 2, (April 1959), p 10.

[10] Julia Rocchi, "Six Practical Reasons to Save Old Buildings," https://savingplaces.org/stories/six-reasons-save-old-buildings#.WBTwSvorI2w (accessed October 29, 2016).

6. **The loss of historic resources is permanent.** There is no chance to renovate or to save a historic site once it is gone.

Generally, 'preservation' takes three forms: ethics, treatment, and process.[11] As an ethic, preservation has both acceptable and unacceptable approaches to the protection of resources. Preservation treatment is the application of best practices and means/methods to ensure continuing use of a resource. Preservation as a process includes anything involving the care and protection of historic resources such as identification, evaluation, documentation, management, treatment, or any combination of these actions.

The history of organized historic preservation efforts in the United States dates to the 1850s, when Ann Pamela Cunningham's Mount Vernon Ladies Association saved George Washington's house from neglect and inevitable ruin. Teddy Roosevelt's Antiquities Act of 1905 created the National Landmark title and tasked the Secretary of the Interior with administering Federal land including cultural resources. Woodrow Wilson created the National Park Service (NPS) in 1916 to manage the fledgling National Park System. The first national historic preservation legislation was enacted by Congress in 1935: The Historic Sites Act (HSA). The HSA permitted the Secretary of the Interior to create preservation-oriented programs including the Historic American Buildings Survey (HABS) and the Historic American Engineering Record (HAER). Congress established the National Trust for Historic Preservation in 1949 to further the policy of the Historic Sites Act.[12] The NHPA of 1966 is the broadest and arguably most significant piece of Federal preservation legislation. The NHPA established the NRHP, the list of National Historic Landmarks (NHLs), and the State Historic Preservation Offices (SHPOs) to engage the public at local levels. The NHPA, and its amendments, guide preservation management at public agencies such as the Department of Defense (DoD).

2.2.2 What is a historic property?

The NPS defines a historic property as "a district, site, building, structure, or object significant in American history, architecture, engineering,

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[11] National Park Service, "Secretary of the Interior's Standards and Guidelines; Preservation Terminology," https://www.nps.gov/history/local-law/arch_stnds_10.htm, (accessed June 26, 2017).

[12] National Park Service, *Federal Historic Preservation Laws* (Washington, DC: National Center for Cultural Resources, 2006), 2.

archeology or culture at the national, State, or local level."[13] Through the NRHP, the Secretary of the Interior has established formal criteria for determining the historic and architectural significance of a property across a wide range of geographic areas. The National Register Criteria for Evaluation identifies the resources and defines significance that qualifies a property for listing. Historic properties (or districts) are individually evaluated based on their architectural distinction and association with important events, communities, or even individuals. If a property fulfills all applicable criteria, then it can be listed to the NRHP, a formal and lengthy application process. For most properties, it is generally accepted that if a property meets NRHP criteria, then it achieves 'historic' status and falls under the regulatory protection of the NHPA.

Under NHPA, any activity impacting a historic building must follow a code of preservation ethics. The Secretary of the Interior has published preservation ethical standards in their Standards for Historic Preservation:[14]

- Standard 1: A property will be used as it was historically or be given a new use that maximizes the retention of distinctive materials, features, spaces, and spatial relationships. Where a treatment and use have not been identified, a property will be protected and, if necessary, stabilized until additional work may be undertaken.
- Standard 2: The historic character of a property will be retained and preserved. The replacement of intact or repairable historic materials or alteration of features, spaces, and spatial relationships that characterize a property will be avoided.
- Standard 3: Each property will be recognized as a physical record of its time, place, and use. Work needed to stabilize, consolidate, and conserve existing historic materials and features will be physically and visually compatible, identifiable upon close inspection, and properly documented for future research.
- Standard 4: Changes to a property that have acquired historic significance in their own right will be retained and preserved.
- Standard 5: Distinctive materials, features, finishes, and construction techniques or examples of craftsmanship that characterize a property will be preserved.

[13] National Park Service, "Preservation Terminology."

[14] Ibid.

- Standard 6: The existing condition of historic features will be evaluated to determine the appropriate level of intervention needed. Where the severity of deterioration requires repair or limited replacement of a distinctive feature, the new material will match the old in composition, design, color, and texture.
- Standard 7: Chemical or physical treatments, if appropriate, will be undertaken using the gentlest means possible. Treatments that cause damage to historic materials will not be used.
- Standard 8: Archeological resources will be protected and preserved in place. If such resources must be disturbed, mitigation measures will be undertaken.

The goal of these standards is to maintain integrity of historic places. According to the NPS, "Integrity is the ability of a property to convey its significance."[15] National Register Bulletin 39[16] states the following:

> Significance is defined as the importance of a property to the history, architecture, archeology, engineering, or culture of a community, a State, or the nation. Significance may be based on association with historical events (Criterion A); association with a significant person (Criterion B); distinctive physical characteristics of design, construction, or form (Criterion C); and potential to yield important information (Criterion D).

For public agencies and historic property owners and managers, the emphasis on maintaining integrity is an immense challenge, particularly when dealing with a wide range of factors ranging from differences in facility use and occupancy, changes in availability of original building materials, skilled artisans in historic trades, requirements of modern fire and safety codes, energy efficiency updates, encroachment from new construction, and the like. To tackle this challenge, preservation specialists must help build the bridge between the past and the present.

2.2.3 Federal regulation of historic preservation

At the federal level, the Department of the Interior and NPS are responsible for promoting the preservation of cultural resources. The NPS

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[15] National Park Service, *National Register Bulletin; How to Apply the National Register Criteria for Evaluation* (Washington, D.C.: Department of the Interior, 1995), 44.

[16] Eleanor O'Donnell, *National Register Bulletin No. 39; Researching a Historic Property* (Washington, D.C.: Department of the Interior, 1991, rev. 1998), 2.

maintains regional offices and provides technical advice, information, and guidance on historic preservation. The NRHP, the National Historic Landmarks Survey, and the Tax Credit Rehabilitation Program are all administered by the NPS. The National Trust for Historic Preservation is a Federally chartered non-profit organization "dedicated to protecting historic buildings, neighborhoods, and sites through education and advocacy."[17] The Advisory Council on Historic Preservation (ACHP) is an independent federal agency that advises the President and Congress on national preservation issues. The implementation of the NHPA of 1966, such as Section 106 Review, is also a responsibility of the ACHP. The NRHP is a federally maintained inventory of historic places and repository of documentation of historic properties.

At the DoD level, the Federal Preservation Office functions as the historic preservation policy entity for all DoD historic properties. Sitting within the Office of Secretary of Defense's Environmental Management Directorate, the federal preservation office directs how Federal regulations related to historic resources are implemented and coordinated. The DoD historic property portfolio includes a total of 73 NHLs, 694 entries on the NRHP, and over 19,000 individual historic properties including over 16,700 known archaeological sites and 3,200 historic buildings. The majority of these resources are managed at the installation level by the Services, working closely with various stakeholders, including Indian tribes, SHPOs, and the ACHP. This ensures DoD's compliance with applicable Federal laws, Executive Orders, and regulations, while simultaneously supporting the multiple missions of the DoD.

The management of cultural resources at the installation level is generally conducted via subject matter experts situated in Environmental offices. Often these offices are embedded within the directorates responsible for facilities and construction. This is a logical location as the activities with the greatest potential impact to both archaeological sites, sacred sites and historic structures come from ground disturbance and other activities related to construction and maintenance projects. However, even with a cultural resource program or staff working at an installation, it is often difficult to connect the dots between the regulatory management and coordination activities of their duties with the project execution duties

[17] The National Trust for Historic Preservation, https://savingplaces.org/we-are-saving-places#.WBd6VvorI2x (accessed October 28, 2016).

Implementation of the Secretary of the Interior's Standards for Historic Preservation will influence all construction phases and many scopes of work. As a result, it is imperative to identify how applying proper preservation practices will impact the efficiency of a project delivery system.

2.3 History of modern construction management

Construction management comprises its own distinct theories and methodologies. It is important to examine and understand the origin of these processes when looking to understand the perspective of facilities and construction professionals. Often times, the cultural resource expert comes armed with an impressive list of preservation credentials, however, they may lack direct experience or exposure to the science behind construction and facilities management. Even students coming out of architectural history programs may not have had the requirements or access to courses in project delivery systems and methodologies. Therefore, this chapter endeavors to cover the basics of the primary methods and processes utilized by the industry in order to set a backdrop from which to examine the ensuing case studies from.

The Construction Management Association of America (CMAA) defines construction management as "a professional service responsible for the planning and control of resources within a project framework. Applying effective management techniques to the planning, design, and construction of a project from inception to completion is crucial for controlling time, cost and quality."[18] Different forms of professional construction management are implemented on all scales of construction projects and tailored to the requirements of the contract(s). Owners, such as the DoD and other agencies, typically utilize either internal staffing or third party firms to fulfil project management requirements. The evolution of construction management parallels the evolution of the broader field of professional project management.

'Management' of construction has been around, of necessity, for as long as construction itself. According to the CMAA, "Over the years, construction management has been thought of as part of the engineer's portfolio, as an ancillary service provided by architects, and as a routine part of what

[18] The Construction Management Association of America, "An Owners Guide to Project Delivery Methods."

construction contractors do."[19] It has been discussed and taught as part of a wide variety of college and university curricula. Despite the growth of construction management in the 1960s, the genesis of professional construction management can be traced back to the early twentieth century and broken into four modern periods (Table 1).[20]

Table 1. Project management in the twentieth century.

Periods	Themes
1900 – 1939	Development of Management Theory
1940 – 1979	Application of Management Science
1980 – 1994	Application of Computer Science
1995 – present	Accessibility of Internet Resources

2.3.1 1900 to 1939: Development of management theory

The origins of modern construction project management systems are found in the early twentieth century. During this time, large-scale projects in United States required innovative management methods. Construction projects like the Empire State Building (1930–1931), Golden Gate Bridge (1933–1937), the Hoover Dam (1931–1936), and the Panama Canal (1904–1914) required the organization of large-scale labor forces. Business government leaders found themselves faced with the task of organizing the labor of thousands of workers and the processing and assembling of unprecedented quantities of raw material. The resulting studies of managing labor and theories on improving production, marked the beginning of modern construction management.

Academic analysis of work began at the turn of the twentieth century. Frederick Winslow Taylor (1856–1915) was an American mechanical engineer and theorist who sought to improve industrial efficiency through studying 'work'. He is regarded as the father of scientific management and was one of the first management consultants. Taylor was an intellectual leader of the Progressive Era 'Efficiency Movement,' showing labor can be analyzed and improved by focusing on its elementary parts. In his 1911

[19] The Construction Management Association of America, "Construction Management: Evolution of a Profession" cmaanet.org, http://cmaanet.org/files/files/evolutionofthecmprofession.pdf (accessed October 24, 2016), 1.

[20] Elias G. Carayannis et. al., T*he Story of Project Management: An Interdisciplinary Approach* (Westport: Quorum Books, USA, 2003), http://home.gwu.edu/~kwak/PM_History.pdf (accessed October 20, 2016), 1.

publication, *The Principles of Scientific Management*, Taylor introduces the concept of working more efficiently, rather than working harder and longer.[21] Taylor's associate, Henry Laurence Gantt (1861–1919), studied the order of operations in work. Gantt was an American mechanical engineer, who pioneered the use of management visual aids. Gantt created the Gantt chart in the 1910s. The Gantt chart is a popular style of bar chart that illustrates a project schedule. Gantt charts have been adapted for construction projects ever since their inception.

The Hoover Dam (1931–1936) is an example of a large pre-1940 construction project that employed Gantt charts. The charts illustrated the coordination and scheduling of definable scopes of work. Coordination was essential between the members of the joint venture team of six construction contractors. From the creation of Boulder City to accommodate the staff to the delivery of concrete and steel at critical intervals, Gantt Charts were used throughout the $175 million project. Because of advanced construction management techniques, the Hoover Dam is a continually operating historic structure that still produces electricity while drawing one million tourists per year.

Interestingly enough, defense projects fostered the further development of formal project management in the United States as World War II ushered in science and defense projects. The Manhattan Project to develop U.S. nuclear weapons capability required immense Federal planning and coordination over vast geography while maintaining secrecy. Both the Navy's ballistic missile program of the 1950s and NASA's space flight program of the 1960s were Federally funded, requiring the organization of huge private contractors and government personnel. Innovations in information technology with analog computing, sped up data collection, analysis, and dissemination. Math based project management tools began to emerge with the use of early computers.

Two core mathematical project-scheduling models were developed between 1940 and 1969: Critical Path Method (CPM) and Program Evaluation and Review Technique (PERT). CPM was developed by the DuPont Corporation and the Remington Rand Corporation to improve the management of Manhattan Project facilities. CPM method determines 'float,'

[21] Daniel Nelson, *Frederick W. Taylor and the Rise of Scientific Management*. (Madison: University of Wisconsin Press, USA, 1980), 171–173.

or schedule flexibility by calculating the earliest and latest start and finish dates of each task or definable scope of work (DSW). Costs were also calculated in the CPM method based on scheduling DSWs. Relationships between costs and schedule could now be identified and tracked on CPM Flow Charts. PERT was developed by Booz-Allen & Hamilton in conjunction with the Lockheed Corporation as part of the United States Navy's Polaris missile submarine program. The PERT method identifies the tasks involved in completing a given project and the time needed to complete each DSW is calculated. Realistic estimations of minimum time needed for completing a project could be made based on DSW calculations. Construction project management adopted both PERT and CPM methods.

As the construction industry continued to grow in the 1960s, so did the need for a formal Construction Management profession. The idea of separating construction management into a separate contract for professional services began to gain attention in the 1960s.[22] The number of large infrastructure and redevelopment construction projects increased but cost over runs and delayed schedules plagued the industry. Architect and early construction management program designer George T. Heery[23] stated the following:

> The 60s saw very high rates of inflation in the economy…and the cost of money began to soar in the credit markets. Further, up until that time, there was no separate profession dedicated to the overall management of these huge projects on behalf of the owner.

Architecture firms began to offer design plus construction management services acting as a representative of the client during the construction phase. Projects with formal construction managements proved more efficient than previous projects of similar scale.[24] Formal and professional Construction Management was born.

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[22] The Construction Management Association of America, "Construction Management: Evolution of a Profession", 1.

[23] George T. Heery, "A History of Construction Management Program Management and Development Management," brookwoodgroup.com, http://brookwoodgroup.com/downloads/2011_history_CMPMDM.pdf, p 2 (accessed October 21, 2016).

[24] Heery, "A History of Construction Management."

2.3.2 1980–1994: Application of computer science

During the 1980s and early 1990s, the digital revolution in information technology improved efficiency in managing complex project schedules. The construction industry began utilizing computer technology as project management tools. Prior to the 1980s, construction was unable to use computer-aided management systems because mainframe systems were too difficult to use, requiring computer engineers. In the early 1980s, project management software for PC became widely available, produced by several companies.[25] Increased accessibility, ease of use and decreasing software costs allowed construction managers to adopt computer programs to aid in management, scheduling and estimating.

The England-France Channel project (1989-1991), also known as the 'Chunnel', is one of the earliest and largest projects employing computerized project management. The Chunnel project required cooperation of governments, financial institutions, engineering companies, construction contractors, and various international organizations. Accurate coordination of all scopes of work was required to achieve efficiency in costs, schedule, and quality. Language, metrics, and other forms of communication were standardized through the use of management software. The adoption of computer-aided project management practices leads to the completion of the project in under two years with few change orders, increased productivity, and produced a reliable product.[26]

2.3.3 1995–present: Accessibility of internet resources

Accessibility to computer-aided project management tools increased with the creation of the Internet and marks the latest change in project management. Between 1995 and 2000, the construction project management community adopted internet technology to become more efficient in controlling and managing various aspects of projects.[27] The Internet provided a fast, interactive, and customizable platform that allowed owners, managers, and contractors to browse, purchase and track products and services in real-time. The Internet permitted organizations to be more productive, more efficient and more customer oriented. In recent years, Internet-

[25] Crayannis, et al., *The Story of Project Management,* 5–6.

[26] Ibid, 6.

[27] Crayannis, et al., *The Story of Project Management*, 6–7.

accessible construction management programs, such as BIM 360™, SiteMax®, e-Builder, ™ and Procore©, have become widely adopted.

An example of the latest evolution in construction project management is the United States Department of Energy's Innovation Hub for Energy-Efficient Buildings. A team of construction companies was chosen by Pennsylvania State University to provide integrated construction management services for the $30 million retrofit of the circa 1936 Building 661 at the Navy Yard in Philadelphia, Pennsylvania. "The building functions as a living laboratory to showcase multiple energy saving technologies, with built-in monitoring and verification strategies for testing and performing energy efficiency research."[28] This public-private partnership combined internet-based, real-time construction management and monitoring software with traditional construction management practices. It is an example of advanced computer technology aiding the construction manager in scheduling and projecting phases and tasks during the rehabilitation and renovation of a historic structure.[29]

Construction project management originated as a way to manage large-scale construction projects to become a standard component of all construction. Formalization and increased professional standards have elevated construction management to the level of academic curriculum. Construction management has become a lucrative field with room for individual growth, and many colleges and universities offer undergraduate and graduate degrees in construction management. The need for professional managers will increase in the future as the number of projects in energy, manufacturing, transportation, and historic preservation increases. However, while there are an increasing number of professionals obtaining professional degrees and certifications in construction and/or project management, like many other disciplines there is often an advantage to be had in cross training in related fields or specialties. As will be seen in this study, historic preservation construction and maintenance presents different challenges and requires an understanding of the varied methodologies, regulations, and approaches.

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[28] Energy Efficient Buildings Hub, "The Center for Building Energy Science," eebhub.org, http://www.eebhub.org/projects-list/navy-yard-building-661/ (accessed October 24, 2016).

[29] Balfour Beatty, "Balfour Beatty awarded U.S. Department of Energy Innovation Hub project at Philadelphia Navy Yard," balfourbeattyus.com, http://www.balfourbeattyus.com/Media-Center/PressReleases/Balfour-Beatty-awarded-U-S--Department-of-Energy-I (accessed October 24, 2016).

2.4 Determining a project delivery system

Informal project delivery systems have existed since the beginning of rudimentary labor and project management. Formal project delivery systems developed in the 1960s following the growth of professional project management. As construction contracts became increasingly detailed and frankly, more liturgic, the need for standardized delivery systems developed. As the construction industry evolved since the 1960s, project delivery systems also evolved. In reaction to the growing complexity of construction contracting, project delivery systems adapted to improve efficiency and compliance. The resulting complexities of these highly developed project delivery systems often make the decision of one system over another a difficult task for owners. With a variety of choices available to owners, the ultimate decision will have pros and cons and confusion is inevitable. However, increased complexity can offer the owner or developer more flexibility to choose an appropriate and effective system for a project. With a variety of delivery methods in use today across the design and construction industry, it is possible to choose a delivery method that best meets the unique needs of each owner and each project. These options are available to public agencies as well, depending on their contracting procedures and rules. Certainly, the DoD is exploring the use of different project delivery systems to exercise efficiency and effectiveness in project execution.

The selection of the proper project delivery system is very serious, as it will influence the entire undertaking from design to final walk through. There are five key considerations that influence the selection of the delivery system for a project: **budget, design, schedule, risk assessment, and the owner's level of expertise**.[30] In this section, these considerations are examined more closely.

Determining a realistic budget before the design phase is important to evaluate project feasibility, to secure financing, to evaluate risk, and as a tool to choose from among alternative designs or site locations. Once the budget is determined, the owner requires that the project be completed at or near the established budget figure. Owners must decide how quickly they need to establish final project costs and how much risk there is of

[30] The Construction Management Association of America, "An Owners Guide to Project Delivery Methods," 7.

exceeding this cost.[31] During this budgeting phase, it is critical for various environmental costs, such as National Environmental Policy Act (NEPA) and NHPA, to be considered and, if necessary, appropriate line items included in the final budget development.

Design is the second important component of the owner's decision process. Achieving "the desired function of a facility as designed while successfully fulfilling the needs of the owner and users" is paramount.[32] Therefore, the design team should be well qualified in the type of facility being designed, most especially when approaching historic structures, or working within historic districts. In addition, the owner must ensure that the program needs are clearly conveyed to the design team. Since the design of the facility must be buildable and design intent must be properly communicated, the owner requires that the design documents are constructible, complete, clear, and coordinated. The documents should properly incorporate unique features of the site to include subsurface conditions, interfaces with adjoining properties, access, and other characteristics. It is important for the owner to recognize quality in design. Quality in design is based on the architect's experience and expertise. For the DoD, the "quality in design" aspect is sometimes constrained by regulatory rules and processes for competitive contract selection or award.

The owner has similar needs in the area of scheduling. The dates of design commencement, construction completion and ultimately the operation of a new facility can be critical.[33] Therefore, a realistic assessment of project duration and sequencing needs to be performed early in the planning process. The schedule must then be monitored and updated throughout the design, construction, and pre-occupancy phases to achieve the desired goal. An owner must decide how critical it is to minimize schedule duration for a project. DoD often works with challenging timelines for execution, particularly when funding arrives quickly and must be executed to meet a fiscal year deadline and/or support a mission critical task.

Understanding risk is another determining factor. Construction risk is defined as "the probability of financial loss associated with the physical

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[31] The Construction Management Association of America, "An Owners Guide to Project Delivery Methods," 9.

[32] Ibid.

[33] Ibid.

(construction) phase of a construction project."[34] In construction, issues of risk are closely tied to the status of the local construction market, on-site safety, the schedule, and the budget. "The owner requires an understanding of the risks involved in construction and should make a conscientious decision regarding allocation of these risks among project participants, so that all areas of exposure are properly understood."[35] In considering risk allocation, the owner strives to assign risks to those parties that best exercise control over those aspects. For example, it would typically be problematic to require that the contractor correct problems due to design errors or changes at no extra cost since a contractor generally has little control over the cause or magnitude of such errors or changes.[36] An owner must decide how much project risk they are comfortable in assuming.

The owner's expertise is the final important influence on choosing a delivery method. According to An Owners Guide to Project Delivery Methods, "an owner's familiarity with the construction process and level of in-house management capability has a large influence over the amount of outside assistance required during the process, and may guide the owner in determining the appropriate project delivery method."[37] This point is important because DoD project managers need to have familiarity and training in the various project delivery system method available in order to make the best selection for their assigned project.

To assist owners, several organizations and institutions have performed extensive research on project delivery systems and published guides to simplify the decision-making process. The CMAA, American Institute of Architects (AIA), Association of General Contractors (AGC), and the Design-Build Institute of America (DBIA) are professional organizations that collect and disseminate data regarding all aspects of the design and construction industries. Procurement, contracting, and construction sectors within the DoD and the Department of Transportation (DOT) have also investigated project delivery systems. The Journal of Construction Engineering and Management, McGraw Hill Construction and numerous

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[34] The Construction Management Association of America, "An Owners Guide to Project Delivery Methods," 9.

[35] Ibid., 10

[36] Ibid.

[37] Ibid.

construction education programs perform academic studies and publish their findings. Despite the enormous amount of analysis on project delivery systems, there are no easy answers in determining the most efficient one.

2.5 Preservation and construction

2.5.1 Preservation challenges

The DoD is responsible for the largest collection of historic properties in the United States. The agency faces the typical preservation challenges but at an unmatched scale. These unique challenges include abiding by applicable regulation at the federal, state, and local levels, identifying, understanding, and overcoming material and design flaws inherent in old buildings, assembling project teams with the necessary sensitivity and experience, and creating contracts, documents and systems that are applicable to preservation construction. It is essential for DoD project teams to recognize the necessity of preserving historic resources through the application of preservation theory and proper practices.

Historic buildings often have deficiencies in life safety and accessibility. Additional challenges include updating utilities and decreasing or ending building degradation. However, modifications to a historic building might impact a properties historical integrity. An installation must identify historic properties potentially affected by any undertaking, assess its effects, and seek ways to avoid, minimize or mitigate any adverse effects. When work is deemed necessary, improvements ideally should follow The Secretary of the Interiors Standards for the Treatment of Historic Properties with rare exceptions. Historic elements and materials should be preserved to the greatest extent possible.[38] For example, small components of a structure's historic fabric, such as door and window hardware, can get lost on large-scale preservation projects. These small components can result in significant loss of integrity if not handled properly, requiring expertise and skill in project execution to ensure these features are not overlooked.

Despite sharing project delivery systems, restoration, conservation, preservation, and rehabilitation of historic buildings differ from new

[38] National Park Service, *Secretary of the Interior's Standards for the Treatment of Historic Properties; with Guidelines for Preserving, Rehabilitating, Restoring, and Reconstructing Historic Buildings* (Washington, D.C.: Department of the Interior, 1992), 26.

construction. Many project components are unique to preservation construction and can often be difficult for inexperienced designers, contractors, and clients. These unique factors include: research and documentation, hazardous materials, unforeseen conditions, archaic and obsolete materials and construction, preconstruction investigation, realistic budgeting, detailed specifications, space limitations for utilities, extended maintenance plans, and most importantly integrating preservation guidelines with other regulatory requirements such as the Americans with Disabilities Act (ADA) and life/safety regulations such as fire code, structural stability, and Anti-Terrorism Force Protection (ATFP).[39]

2.5.2 Preservation professionalism in construction

Establishing the preservation team is the first component of the project. The preservation team includes specialists experienced in the design, development, and execution of preservation projects. These include architectural historians, conservators, historic architects, historic engineers, historic preservationists, and historians. Architectural historians study the development of building practices through written records and design and the examination of structures, sites, and objects. Conservators prolong the physical and aesthetic life of prehistoric and historic material culture through documentation, preventative care, treatment, and research. Different combinations of these professionals may be required for specific preservation projects. Historic architects apply artistic and scientific principles to the research, planning, design, and management of the build environment. Historic engineers apply scientific principles to the research, planning, design, and management of structures and machines. Historic preservationists apply strategies to promote the identification, evaluation, documentation, registration protection, treatment, continued use, and interpretation of prehistoric and historic resources. Historians study the past through written records, oral history, and material culture.[40] Projects may also require professional archaeologists to join the team, particularly in cases of new construction in areas with known or likelihood of buried archaeological sites. They may also require input of Tribal historic experts when a project is occurring within or near traditional cultural properties or

[39] Swanke Hayden Connell Architects, *Historic Preservation Project Planning & Estimating* (Kingston: R.S. Means, USA, 2000), xxii.

[40] Swanke Hayden Connell Architects, *Historic Preservation Project Planning & Estimating*, 12–16.

sensitive resource locales where viewshed integrity is important (bluffs, mountains, etc.).

Basically, the overall project team represents as many disciplines as the project requires. All members of the historic project team should have specific training outlined by the National Parks Service's Professional Qualification Standards and/or adequate prior experience. The Secretary of the Interior's Historic Preservation Professional Qualifications Standards include minimum requirements for professionals practicing in the field of historic preservation.

The standards address the following three components:[41]

1. Academic degrees or comparable training
2. Professional experience
3. Products and activities that demonstrate proficiency in the field of historic preservation

In general, a professional must have a graduate degree in the corresponding or similar field and at least two (2) years of full-time professional experience. Minimum amounts of education and/or training along with full-time professional experience are defined by the qualification standards.[42]

2.5.3 Project phases

Documentation is the foundation of a successful historic construction project. The Construction Specifications Institute and The Association for Preservation Technology International developed Standard TD-2-8, "A Guide to Preparing Design and Construction Documents for Historic Projects."[43] This document is the industry standard for developing design and construction documents for preservation projects. Phase one of any historic construction project is investigation and documentation. This initial phase includes historic research, Existing Condition Surveys (ECSs), and Historic Structure Reports (HSRs). Historic research gathers data such as the applicable technical data on architectural conditions, material

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[41] National Park Service, *The Secretary of the interior's Historic Preservation Professional Qualifications Standards* (Washington, D.C. The National Parks Service, USA, 1997), 1.

[42] Ibid.

[43] Construction Specifications Institute, *Guide to Preparing Design and Construction Documents for Historic Projects* (Alexandria: The Construction Specifications Institute, USA, 1996), p 3.

compositions and sources, and building systems.[44] The information collected becomes the basis of on-site documentation of existing conditions. The ECS is the inspection and documentation of the building's composition, design, and as-built conditions. This survey includes visual inspection and scientific analysis. The ECS may also require invasive, destructive, or investigational processes. [45] For example, the internal conditions of a brick-veneered wall cannot be determined without cutting and removing brick to create a probe. The invasiveness should be kept to a minimum. The HSR documents the existing condition of the building based on a general building inspection and includes a historic narrative based on archival data.[46]

Phase two is planning and predesign. This phase includes architectural and engineering 'programming.' Architectural and engineering programs identify the requirements applicable to the building's new design and use, specifically code requirements, historic component conservation, new material requirements, necessary utility updates, required structural improvements, etc. The end products of this phase are the overall scope of work, project budget, and post-construction operational costs.[47]

Phase three is the design phase and includes the schematic design, design development, and construction documents.[48] The project requirements, determined by the planning and predesign phase, are integrated with condition surveys to establish the schematic design. The design team selects products to serve as the construction specifications and creates design drawings that establish the scope of work. Detailed drawings and specification outlines are created later from the general construction documents created in this phase. These products compose the construction

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[44] National Park Service, *NPS-28: Cultural Resource Management Guideline*, http://www.nps.gov/history/history/online_books/nps28/28chap8.htm (accessed October 25, 2016).

[45] Swanke Hayden Connell Architects, *Historic Preservation Project Planning & Estimating,* 18–19.

[46] National Park Service, *NPS-28: Cultural Resource Management Guideline*, http://www.nps.gov/history/history/online_books/nps28/28chap8.htm (accessed October 25, 2016).

[47] Swanke Hayden Connell Architects, *Historic Preservation Project Planning & Estimating,* 18.

[48] American Institute of Architects, "Defining the Architect's Basic Services," http://www.aia.org/aiaucmp/groups/ek_members/documents/pdf/aiap026834.pdf (accessed October 25, 2016).

documents package that will be submitted to contractors.[49] The drawings, specifications, and addendums are used for both bidding and construction.

Phase four is the bidding and negotiating phase and is unique to DBB. It begins by determining necessary qualifications and selecting appropriate contractors. Qualified contractors are determined by either bids, or proposals, and suitability of contractors based on experience and previous projects.[50] At this point, contract inconsistencies are identified and modifications or revisions to documents are determined. Ultimately, contractors are selected by the owner with input from the design team, a contract is signed, and the notice to proceed is issued.

Phase five is the construction phase. The work is administered, and the project is built during this phase. Execution of the project includes submittals, mock-ups, periodic reviews of work, quality assurance and quality control, and final acceptance.[51] If the work conforms to the accepted construction documents, the project should be completed on time and on budget. However, change orders, contingency allowances, and additional unit-price work may increase project costs and scope. The final product is evaluated by the design team, quality control entity, the owner(s), and the operators.[52]

Once the 'punch list,' or final tasks necessary for completion is fulfilled and the owner is satisfied with the work, the project is complete. The project may include ongoing maintenance or operations plans or contracts. Preservation construction projects can be complicated and unique. However, once the historic status of a property is determined, the building owner or operator can decide to move forward on a preservation project. This outline of the project phases is often adjusted based on the specifics of a project. However, these phases are generally accepted and followed in the preservation construction industry. The most critical phase of the project schedule is phase one: investigation and documentation. Without proper investigation and documentation, a preservation project can be difficult or even detrimental to the historic resource.

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[49] Swanke Hayden Connell Architects, *Historic Preservation Project Planning & Estimating,* 20.

[50] Ibid., 21

[51] Ibid.

[52] Swanke Hayden Connell Architects, *Historic Preservation Project Planning & Estimating*, 21.

2.6 Design-Build

DB is a project delivery system used in the construction industry (Figure 1). It is a method in which the design and construction services are contracted by a single entity known as the Design-Builder or Design-Build contractor. There are two main sequential phases to the DB delivery system: the design phase and the construction phase. DB relies on a single point of responsibility contract for the two project phases. There are three variations of the DB project delivery system, as listed below:[53]

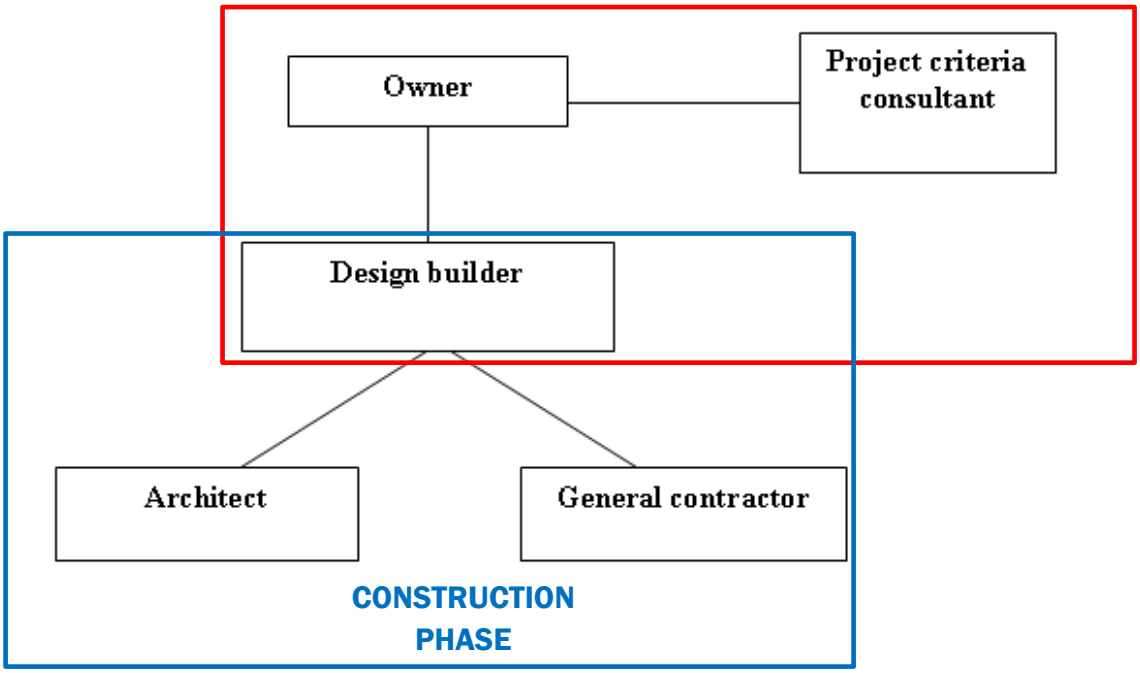
1. Bridging – A designer is retained by the owner to develop the design documents to a specific point (usually schematic level) prior to engaging the DB contractor, who then finishes the design and constructs the project.[54]
2. Public Private Partnership – A private entity or consortium of investors provides some or all of the required capital with a commitment to deliver a completed project for a public sector owner in exchange for revenue that the completed facility is anticipated to generate.[55]
3. True DB – Based on qualifications, a Design-Builder is hired to complete all phases of design and construction including program and schematic design, construction management, trade work and materials. This form is similar to Bridging, but all work is performed under one contract.

[53] The Construction Management Association of America, "An Owners Guide to Project Delivery Methods," 11.

[54] Ibid, 7.

[55] The Construction Management Association of America, "An Owners Guide to Project Delivery Methods," 7.

Figure 1. DB structure and schedule.[56]



2.6.1 Design-Build management process

Often with the DB delivery method, the owner produces bridging documents created by an architect hired by the owner; these bridging documents provide the basis of the design that sets forth their expectations for the design and construction of the project. Typically, these bridging documents contain schematic drawings and specifications. When the owner's architect completes the bridging documents, the job is advertised and/or delivered to selected companies to begin the proposal process. By analyzing bridging documents, the DB entity understands how to create the DB proposal, tailored to the needs and desires of the owner.[57] Unique to DB contracts, the DB entities have the ability to alter the bridging documents and also have more freedom to tailor the design.[58] Any changes to the bridging documents must be approved by the owner.

The DB entities acquire and analyze the bridging documents from the owner, noting all design, materials, and other aspects that need to be

[56] Mary K. Crites, "Getting the Best Value for Our Construction Dollars; A Primer of Construction Delivery Methods for Owners (from an Owner's Biased Viewpoint)," Maricopa Community College. November 2007, http://www.gc.maricopa.edu/adminsvcs/oct_05/insert.pdf (accessed October 28, 2016).

[57] Fernane, "Comparison of Design-Build and Design-Bid-Build," 7.

[58] Cushman and Loulakis, *Design-Build Contracting Handbook*, 9.

completed for their proposal. At that point, the DB entities prepare their final proposal and submit them to the owner. "This proposal is considered their 'bid' for the job, and typically has a guaranteed maximum price (GMP)."[59] Unit prices for individual tasks, based on time and material costs can be requested by the owner and identified in the RFP. These costs are determined by the contractor and reflected in the proposal. The DB entities proposals typically must be turned into the owner at a specific time and place.

After the proposals are accepted, the owner begins a lengthy review process that includes different levels of criteria by which the proposals are judged and scored. This is sometimes referred to as the 'best value' selection process. Best-value is one of three forms of selection: lowest bid, best value, and qualifications-based. Lowest-bid and qualifications-based selection are rare selection processes when DB contractors are desired. Criteria are built into the selection process that allows the owner to select the DB entity based on the best value for the owner.[60] Thus, the owner does not have to be committed to a low bidder. The DB entity that scores the highest in a sum of all the categories is offered the job, contingent on their ability to provide accurate insurance and bond coverage.[61] If the DB entity is able to meet the insurance and bond requirements and accepts the job, a contract is signed and the notice to proceed is issued.

Ultimately, the owner contracts with a single entity that is responsible for the design and construction of the project. Since the DB entity creates the final design and specifications based on the bridging documents, the DB entity is responsible for the design and construction of the project; change orders will not be accepted unless they are owner-requested changes. However, in the case of preservation construction, change orders are more common due to unforeseen field conditions. DB project delivery reduces costs, compresses schedule, reduces number of change orders, and nearly eliminates 'low-ball' bids. It is critical for DB preservation contractors to investigate the property prior to creating a proposal. Identifying existing conditions and potential unforeseen conditions will decrease change orders.

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[59] Fernane, "Comparison of Design-Build and Design-Bid-Build," 7.

[60] Ibid.

[61] Ibid.

2.6.2 Design-Build contracts and contractors

A DB contract has three components: requirements, price, and roles. The contract includes requirements defining the owner's needs and the scope of the contractor's proposal. The contractor's proposal must include production and design work. The contractor's design input varies depending on the extent of the previous design work completed by the owner's design team. In the case of DB projects, GMP is the most common form of pricing. Incentives are established in the contract such as the sharing of remaining balance savings after completion of the project. Finally, DB contracts determine the roles and relationships between the owner and the DB contractor including sub relationships within the DB contractor's scope of work.

The Design-Builder is often a GC, but in many cases a project is led by a design professional (architect, engineer, architectural technologist, or other professional designers). In the case of historic preservation construction, the DB can be an architectural conservator, historic architect, or historic engineer. Some DB firms employ professionals from both the design and construction sector. Where the Design-Builder is a GC, the designers are typically consulting architects, retained by the contractor. Partnership or a joint venture between a design firm and a construction firm may be created on a long-term basis or for one project only.[62] A DB project can be led by a contractor, a designer, a developer, or a joint venture, as long as the DB entity holds a single contract for both design and construction.

2.6.3 History of Design-Build

DB has roots in the 'master builder' approach, one of the oldest forms of construction. Comparing DB to the DBB system, the authors of *Design-build Contracting Handbook* noted that: "from a historical perspective the so-called traditional approach is actually a very recent concept, only being in use approximately 150 years. In contrast, the DB concept—also known as the 'master builder' concept—has been reported as being in use for over four millennia."[63]

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[62] Cushman and Loulakis, *Design-Build Contracting Handbook*, 6.

[63] Ibid.

The architects of ancient Egypt were referred to as 'the overseer of the work.' Not only were they responsible for design and engineering but the construction as well.[64] The Ancient Greeks are credited with the creation of the 'master builder.' Greek master-builders were originally known as 'Arkhitekton', which translates as 'master carpenter,' from which the word architect is derived.[65] Greek stone masons followed the detailed design, known as 'syngraphai,' verbalized by the architect.[66] Roman architect and master builder Marcus Vitruvius Pollio defined the products of 'master builders' to include "firmness, commodity, and delight."[67] Vitruvius had extensive experience in both design and construction.[68]

During the Medieval era, craft guilds dominated the building environment. However, the coordinator of construction projects remained the architect/master builder. Architects of the era rose through the ranks of craftsmen, familiarizing themselves with all aspects of construction.[69] Medieval architects shared DB responsibilities with the major tradesmen and craftsmen. Despite the architects' position, craftsmen greatly influenced or determined designs based on individual expertise and experience.

During the Italian Renaissance, two schools of thought emerged in construction leadership. The master builder concept (essentially DB) continued with such projects as the Dome of the Florence Cathedral by Capomaestro Filippo Brunelleschi. Brunelleschi was the father of mathematical perspective rendering and favored the established role of architect as builder. Leone Battista Alberti introduced the idea of 'architect as artist.' Alberti's designs include the Santa Maria Novella and the Palazzo Rucella, both located in Florence.[70] The 'architect as artist' concept, favored by Alberti, emerged from a pervasive desire of architects to separate themselves from the building trades. Architects sought to align the discipline with professional academic fields such as Art and Law. Architects

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[64] Spiro Kostof, *The Architect: Chapters in the History of the Profession* (Los Angles: Oxford Press, 1977), 10.

[65] Banister F. Fletcher, *A History of Architecture on the Comparative Method for the Student, Craftsman, and Amateur* (New York: Scribners & Sons, 1905), 65.

[66] Kostof, *The Architect*, 12.

[67] Cushman and Loulakis, *Design-Build Contracting Handbook,* 6.

[68] Kostof, *The Architect*, 38.

[69] Ibid., 61

[70] Carlos J. Cardoso and Martin Sell, "History and Introduction to Design-Build" (PowerPoint slides, A Continuing Education Webinar of the American Institute of Architects, April 16, 2009) http://www.aia.org/groups/aia/documents/pdf/aiab090075.pdf (accessed October 28, 2016).

continued distancing themselves from the building trades after the Italian Renaissance. Public perception of architects followed this trend as well.[71]

The American influence on DB began in the 1700s. Several early influential leaders were also master builders, responsible for the design and construction of historically significant structures. According to architect Richard Swett, "Thomas Jefferson was an architect, a problem solver and a master builder"[72] It was common for wealthy men to pursue unpaid design jobs as academic challenges. These individuals were known as 'gentleman amateurs.' In the 1800s, the 'master builder' concept continued, the architect-maintained control of the design and construction phases of projects by providing construction services under a single contract with the client. Prior to the nineteenth century, payment for the design and construction was based on post construction measurements, calculated by independent 'measurers.' "In the early part of the present century (1800s), and for many years before, the architect was commonly the principal contractor for the building …the only way to include whole building in one contract was to make an agreement with someone outside the trades and let him make sub-contracts with the trades."[73] DB was influenced by the concept of the architect/master builder cooperating with trade contractors.

2.6.4 Modern Design-Build

Early twentieth century construction followed the format used in the 18th and 19th centuries: architects and contractors formed a team and combined roles under one 'master-builder. However, newly formed professional societies such as the AIA, founded in 1857, and The AGC, founded in 1918, promoted the differentiation between the design and construction trades.[74] Increasingly, architects removed themselves from the construction process and the corresponding responsibility and liability. Increasingly, project delivery systems, such as DBB, began filling the void created by the progressive separation of design teams and construction

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[71] ibid.

[72] Carlos J. Cardoso and Martin Sell, "History and Introduction to Design-Build" (PowerPoint slides, A Continuing Education Webinar of the American Institute of Architects, April 16, 2009) http://www.aia.org/groups/aia/documents/pdf/aiab090075.pdf (accessed October 28, 2016).

[73] Ibid.

[74] Cardoso and Sell, "History and Introduction to Design-Build."

contractors. The United States Government began favoring DBB systems with legislation such as The Miller Act of 1935.[75]

Today, many architects in the United States and elsewhere provide integrated design and construction services-also known as DB. Despite resistance from professional organizations, designers and GCs have increasingly offered DB services. Until 1979, AIA's code of ethics and professional conduct prohibited their members from "providing construction services."[76] However, the AIA has recently acknowledged that DB is becoming one of the main approaches to construction. In 2003, the AIA endorsed "The architect's guide to DB services," which was written to help their growth number of members acting as DB contractors.[77]

Recently, the DB project delivery system began growing in popularity in the public sector. Following the private sector's lead, Congress passed a law in 1996 permitting the use of the DB project delivery method in procurement and construction, including preservation projects.[78] A study from the US DOT[79] stated the following:

> Design-build delivery has been steadily increasing in the U.S. public building sector for more than 10 years…The primary lessons learned …relate to the types of projects utilizing design–build, the use of best-value selection, percentage of design in the solicitation, design and construction administration, third-party risks, the use of warranties, and the addition of maintenance and operation to design–build contracts.

AIA recognized DB continues to rise in both Public and Private Business Sectors and by the end of year 2006 over 50% of all construction projects were delivered by the DB system.[80] A 2011 study by the DBIA analyzing the DB project delivery method in the United States showed that DB was

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[75] Ibid.

[76] Ibid.

[77] Ibid.

[78] USDOT - Federal Highway Administration, "Design-Build Effectiveness Study" (Washington D.C., US Department of Transportation, January 2006) http://www.fhwa.dot.gov/reports/designbuild/designbuild.htm (accessed October 28, 2016).

[79] Cardoso and Sell, "History and Introduction to Design-Build."

[80] The Construction Management Association of America, "An Owners Guide to Project Delivery Methods," 6.

used on more than 40 percent of non-residential construction projects in 2010, a ten percent increase since 2005.[81]

2.7 Design-Bid-Build

DBB, also known as 'hard-bid' or "traditional method,' is a type of project delivery system where the owner holds two separate contracts, one with the designer and another with the contractor. The designer assists the owner in developing the program and is responsible for design and the development of drawings and specifications. The contractor is responsible for means, methods, and actual construction of the project. There are three main sequential phases to the DBB delivery system: the design phase; the bidding (or tender) phase; and the construction phase. The bidding phase is unique to DBB. The most common type of DBB is 'Multiple Primes' where an owner contracts directly with separate trade contractors for specific and designated elements of the work, rather than with a single general or prime contractor.[82]

2.7.1 Design-Bid-Build management process

In the design phase, the owner selects and retains an architect or design firm to design and produce tender documents on which various GCs will in turn bid. The architect will work with the owner to identify the owner's needs, develop a written program documenting those needs, and then produce a conceptual or schematic design. The drawings become the foundation of the construction drawings and specifications (Figure 2).[83]

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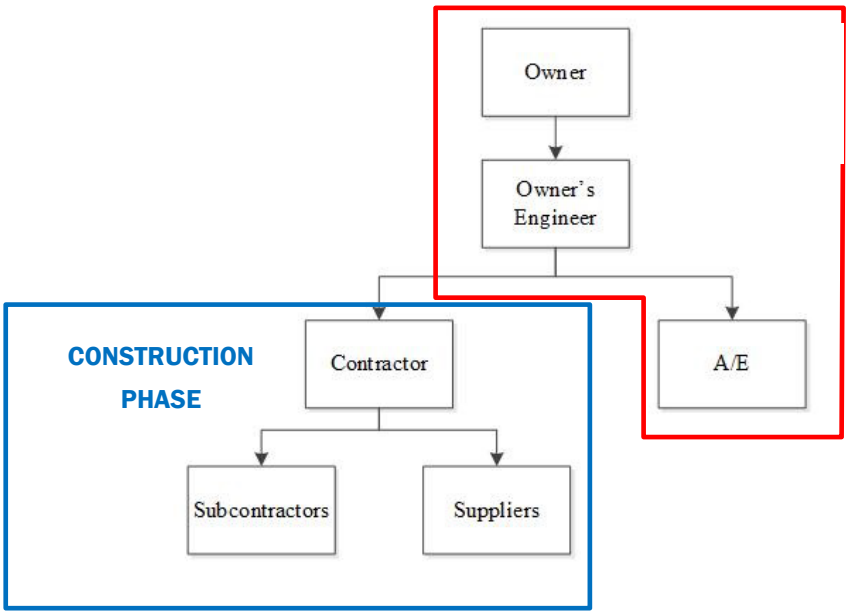
[81] Design-Build Institute of America, "Design-Build Project Delivery Method Used for More Than 40 Percent of Nonresidential Construction Projects, Report Shows" (June 7, 2011) http://www.dbia.org/news/press/rsmeans110606.htm (accessed October 28, 2016).

[82] The Construction Management Association of America, "An Owners Guide to Project Delivery Methods," 6.

[83] American Institute of Architects, "Defining the Architect's Basic Services," http://www.aia.org/aiaucmp/groups/ek_members/documents/pdf/aiap026834.pdf (accessed October 24, 2016).

Figure 2. DBB structure and schedule.[84]



Construction drawings include scaled plans and elevations with dimensions, measurements, and specifications. After the design is completed, the project drawings become the contract documents. These documents are then coordinated by the project manager. When the designer completes the contract documents, the project manager advertises and/or delivers the tender documents to selected companies. This begins the bidding/tender process for GCs.

Bids, or tenders, can be 'open,' in which any qualified bidder may participate, or 'select,' in which a limited number of pre-selected contractors are invited to bid. During the bid phase or tender process, general contracting companies acquire the contract documents and meticulously go through the plans and specifications to note all materials and work that need to be completed. The various GCs bidding on the project obtain copies of the tender documents and distribute the documents to multiple subcontractors for bids on sub-components of the project. Questions may arise during the tender period, and the architect will typically issue clarifications or addenda. From these elements, the contractor compiles a complete 'tender price' for submission by the closing date and time. Unit prices for tasks are determined by time and material costs to the contractor. These prices can

[84] Crites, "Getting the Best Value for Our Construction Dollars."

be requested by the owner, identified in the RFP. These costs are the reflected in the bid. Tender documents can be based on the quantities of materials in the completed construction.[85] Then the GCs prepare their final cost for all labor and materials and submit this to the owner.[86] This is considered their 'bid' for the job.

Once bids are received, the architect typically reviews the bids, seeks any clarifications required of the bidders, ensures all documentation is in order, and advises the owner as to the ranking of the bids. If the bids fall in a range acceptable to the owner, the owner and architect discuss the suitability of various bidders and their proposals. The owner is not obligated to accept the lowest bid, and it is customary for other factors including past performance and quality of other work to influence the selection process.[87] [Note, this is for bidding in general and not specific to the DoD.]

After the bids are accepted, opened, and reviewed by the owner, the GC with the lowest bid and/or best quality value is offered the job, contingent on their ability to provide accurate insurance and bond coverage. If the GC is able to meet the insurance and bond requirements and accepts the job, a contract is signed and the notice to proceed is issued. Since the design is considered as the contract document, and was completed and issued by the owner, any changes that need to be done after the work begins are documented in change order requests submitted to the owner.[88] These changes are then determined to be justified or not and additional costs are agreed upon.

After the project has been awarded, the construction documents may be updated to incorporate addenda or changes issued for construction. The necessary approvals, such as permits, must be received from all jurisdictional authorities for the construction process to begin. The construction phase begins once all components and aspects of the design phase are complete. During the construction phase, the GC coordinates the trades and communicates with the design team. The architect's design team acts

[85] American Institute of Architects, "Defining the Architect's Basic Services."

[86] The Construction Management Association of America, "An Owners Guide to Project Delivery Methods."

[87] Ibid.

[88] Ibid.

as project manager on behalf of the owner, performing all quality assurance and quality control duties and progress inspections.[89]

2.7.2 Design-Bid-Build contracts and contractors

In DBB, two entities (or contractors) hold separate contracts with the project owner. One contract is held with the design team, usually an architectural firm, and one contract is held with the construction team, usually a GC. In the case of historic preservation construction, the design contractor can be an historic architect or engineer and the construction contractor can be an architectural conservator. Multiple subcontracts are held between the construction contractor and trade contractors (or subcontractors). The subcontractors are responsible for completing the individual trade tasks. Unit prices for individual tasks are determined by the subcontractors based on time and material costs and are reflected in the bid.

In a typical DBB delivery system, the owner enters into a contract with an architect or engineering firm. Based on the requirements provided by the owner, the firm creates construction documents including plans and specifications for the implementation of the project. These documents are then used by the owner as the basis to make a separate contract with a construction contractor. The construction company will then build the project based on the documents produced by the architect or engineering firm. Two separate contracts, with two separate entities, are utilized to complete one construction project, including two solicitations and procurement steps.[90]

2.7.3 History of Design-Bid-Build

The DBB project delivery system originated during the Italian Renaissance. Beginning around the 15th century, a movement started within the building industry advocating a separation between design and construction fields. The reason for the separation was that the designer's sole responsibility should be providing pictures, sketches, and models of the design, and the leader of the construction effort was to be responsible to carry out the designer's intent. Leone Battista Alberti led the separation

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[89] The Construction Management Association of America, "An Owners Guide to Project Delivery Methods."

[90] Daren Russell Hale, "An Empirical Comparison of Design/Build and Design/Bid/Build Project Delivery Methods," Master's Thesis (University of Texas, Austin, 2005), 6.

movement and introduced the idea of 'architect as artist.' This concept emerged from architect's increasing desire to separate themselves from the building trades and to align their discipline with the professionalism of academic fields such as Art and Law.[91] Professional architects began distancing themselves from the building trades, and public perception of architects followed this trend as well. As a result, the design phase started to become distinct from the construction phase, an early form of the DBB system. The attempt to separate design from construction occurred very sporadically during the next two hundred years until the beginning of the Industrial Revolution.

The Industrial Revolution marked the next step in the separation of design and construction entities. The division of labor was a paradigm shift emphasized during the Industrial Revolution increasing the use of DBB systems. The distinctions between the intellectual process of design and the physical act of construction became a natural place for division. Furthermore, the need for capital caused constructors to rely upon nonparticipating owners, such as stockholders or banks, to be able to purchase and operate the necessary equipment and employ the large number of laborers required for the new type of construction. The design firms did not require such capital, economically isolating architects from construction contractors.[92] The use of integrated design and construction services declined. DBB grew to meet the requirements of large-scale projects.

2.7.4 Modern Design-Bid-Build

By the turn of the twentieth century, DBB was the favored project delivery system for both public and private projects. DBB grew as a reaction to the favoritism, corruption, and waste associated with major infrastructure projects in the 19th century. Federal contracting reform separated the design and construction phases in the 1930s. The Miller Act of 1935 favored the use of DBB. The Miller Act required that "before any contract exceeding $100,000 is awarded for the construction, alteration, or repair of any building or public work of the United States, the construction contractor must furnish a payment bond and a performance bond."[93] This act helped separate the role of the design entity from the construction entity by

[91] Cardoso and Sell, "History and Introduction to Design-Build."

[92] Ibid.

[93] Cardoso and Sell, "History and Introduction to Design-Build."

requiring bonds that many design firms could not qualify for, thus favoring separate contracts for design phase and construction phase. As a result, DBB became the 'traditional' procurement method for public agencies. By the 1960s, there was a clear division between design and construction in both the public and private spheres.

Despite historically favoring DBB, both public and private entities recently began using alternative project delivery systems such as DB. DBB requires the full cooperation of several entities to successfully complete a construction project. Multiple contracts are created and signed within a single DBB project. Due to such complicated contractual agreements and organizations DBB has begun to lose favor. However, it is still regularly used with success.

2.8 Comparison and conclusion

2.8.1 Comparison of Design-Build and Design-Bid-Build

The debate of DBB versus DB project delivery systems is long running. Countless studies have compared these two project delivery systems, attempting to determine the most effective choice for the client. As with any management system, each system has pros and cons. The choice of implementing DB or DBB in a historic preservation construction should be based on factors of the individual project and can determine the resulting product. Table 4 lists several of the advantages and disadvantages of the DB method. While not a complete list, it highlights the main points for a clearer understanding of this delivery method's strengths and weaknesses.

Table 2. Advantages and disadvantages of the DB method.[94]

Advantages of DB	Disadvantages of DB
Single entity responsible for design and construction	Minimal owner control of both design and construction quality
Construction often starts before design completion, reducing project schedule	Requires a comprehensive and carefully prepared performance specification
Construction cost is known and fixed during design; price certainty	Design changes after construction begins are costly
Transfer of design and construction risk from owner to the DB entity	Potentially conflicting interests as both designer and contractor

[94] Fernane, "Comparison of Design-Build and Design-Bid-Build."

Advantages of DB	Disadvantages of DB
Emphasis on cost control	No contracted party is responsible to represent owner's interests
Requires less owner expertise and resources	Use may be restricted by regulation

To understand that no one project delivery method is flawless, Table 5 describes the advantages and disadvantages of the DBB method. This table also does not include all the data but illustrates some of the decisions to balance when working within this project delivery system.

Table 3. Advantages and disadvantages of the DBB method.[95]

Advantages of DBB	Disadvantages of DBB
Owner controls design and construction	Requires significant owner expertise and resources
Design changes easily accommodated prior to start of construction	Shared responsibility for project delivery
Design is complete prior to construction award	Owner at risk to contractor for design errors
Construction cost is fixed at contract award (until Change Orders)	Design and construction are sequential, typically resulting in longer schedules
Low bid cost, maximum competition	Construction costs unknown until contract award
Relative ease of implementation	No contractor input in design, planning, or value engineering (VE).
Owner controls design/construction quality	

2.8.2 Conclusion

Historic buildings provide a tangible connection to the past and contribute to a community's identity and stability. Their preservation allows generations to make connections with their past and creates an identifiable sense of place. Construction management systems contribute to the efficiency and vital to the economic viability of preservation construction.

[95] Ibid.

The five factors that influence the choice of project delivery system are budget, design, schedule, risk assessment, and the owner's level of expertise. Budgets are often determined by the owner based on accessible capital. Design is determined by the schematic vision of the owner, documented by the architect. Schedule is based on the owner's needs and the established requirements of the scope of work. The risks vary based on the size and scope of the project and are financial in nature. Finally, the owner's level of expertise is a direct result of previous experience in procurement, design, and construction, especially with projects involving historic properties.

The debate of DBB versus DB project delivery systems is long running. Many studies have compared these two project delivery systems attempting to determine the most effective choice for the client, some relevant to preservation construction, whereas others were not. The studies' relevance (or irrelevance) was due to the project component unique to preservation construction. Such studies include Sanvido and Konchar's Pennsylvania State University study,[96] the American Society of Civil Engineers study,[97] and several Design-Build Institute of America studies.[98]

DB has gained favor lately. The cost and schedule reduction and decreased litigation associated with DB project delivery have been demonstrated repeatedly. For example, Victor Sanvido and Mark Konchar of Pennsylvania State University found that DB projects are delivered 33.5% faster than projects that are designed and built under separate contracts (DBB).[99] Sanvido and Konchar also showed that design–build projects are constructed 12% faster and have a unit cost that is 6.1% lower than DBB projects.[100] Similar cost and time savings were found in a comparison study of DB, and DBB for the water/wastewater construction industry, according to a study by the American Society of Civil Engineers.[101] A study by one of

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[96] Konchar and Sanvido, "Comparisons of United States Project Delivery Systems."

[97] Douglas D. Gransberg, James E. Koch, and Keith R. Molennar, *Preparing for Design-Build Projects: A Primer for Owners, Engineers, and Contractors* (Reston, VA: American Society of Civil Engineers, 2006).

[98] Design-Build Institute of America, "Design-Build Project Delivery Method Used for More Than 40 Percent of Nonresidential Construction Projects, Report Shows," (June 7, 2011) http://www.dbia.org/news/press/rsmeans110606.htm.

[99] Konchar and Sanvido, "Comparisons of United States Project Delivery Systems," 442.

[100] Ibid., 443.

[101] Douglas D. Gransberg, James E. Koch, and Keith R. Molennar, *Preparing for Design-Build Projects: A Primer for Owners, Engineers, and Contractors*. (Reston, VA: American Society of Civil Engineers, 2006), p 231–232.

the world's largest firms underwriting professional liability and specialty insurance programs found that from 1995–2004, only 1.3% of claims against architecture or engineering firms were made by DB contractors.[102]

The rise of DB project delivery has threatened the traditional hierarchies of the design and construction industry. As a result, a debate has emerged over the value of DB as a method of project delivery. Several recent studies bolster the argument against the use of DBB in construction projects.[103] Federal, State, locally and privately funded projects are increasingly relying on DB services rather than the 'traditional method' (DBB). It is important to analyze delivery systems in the context of historic preservation due to the difficulties associated with preservation construction, including pre-design investigation, unforeseen conditions, hazardous, rare, degraded, and/or obsolete materials, and outdated construction procedures.

Similar studies should be performed on a larger scale, compiling data from the increasing number of preservation construction projects. As with any management system, each system has pros and cons, and upon which future studies should expand. The choice of implementing DB or DBB in a historic preservation construction should be based on factors of the individual project and can determine the resulting product.

[102] Konchar and Sanvido, "Comparisons of United States Project Delivery Systems," 443.

[103] Ibid.

3 Site Visits

When writing the proposal for this project, the Texas Military Department reached out to several installations and received some verbal interest in the project. These installations included Naval Base Kitsap, WA; Marine Corps Base Hawaii; F.E. Warren Air Force Base, WY; Naval Air Station Pensacola and Texas Army National Guard Headquarters, TX. In fact, Naval Base Kitsap, Naval Air Station Pensacola and Texas Army National Guard wrote letters of support for the project. As the field work for the project progressed, Pensacola was hit by a hurricane and many historic properties were damaged. In addition, F.E. Warren was unavailable during the site visit scheduling due to a staff restructuring. As a result, the project team decided to add Schofield Barracks and Wheeler Field, HI to the site visits as well as add additional case studies to the report in Chapter 4. The researchers arranged the site visits with the installation CRMs. The intent was to travel to the installations and meet with the CRM and have an informal discussion on their experiences with DB and DBB construction methods and cultural resource management. There was not a standard set of questions for all CRMs since the construction processes were different for each of the three services represented. For all of the site visits, the CRMs invited other staff to the meetings to help provide additional information on the construction process. The site visits included a tour of the historic properties and recent construction efforts on post.

3.1 Schofield Barracks, Honolulu, HI

The CERL team, consisting of a historic architect and a historic landscape architect, visited Schofield Barracks in October 2016. Present for the initial meeting from Schofield Barracks were an architectural historian and a master planner, as well as several project engineers, all with the Directorate of Public Works (DPW).

3.1.1 Background

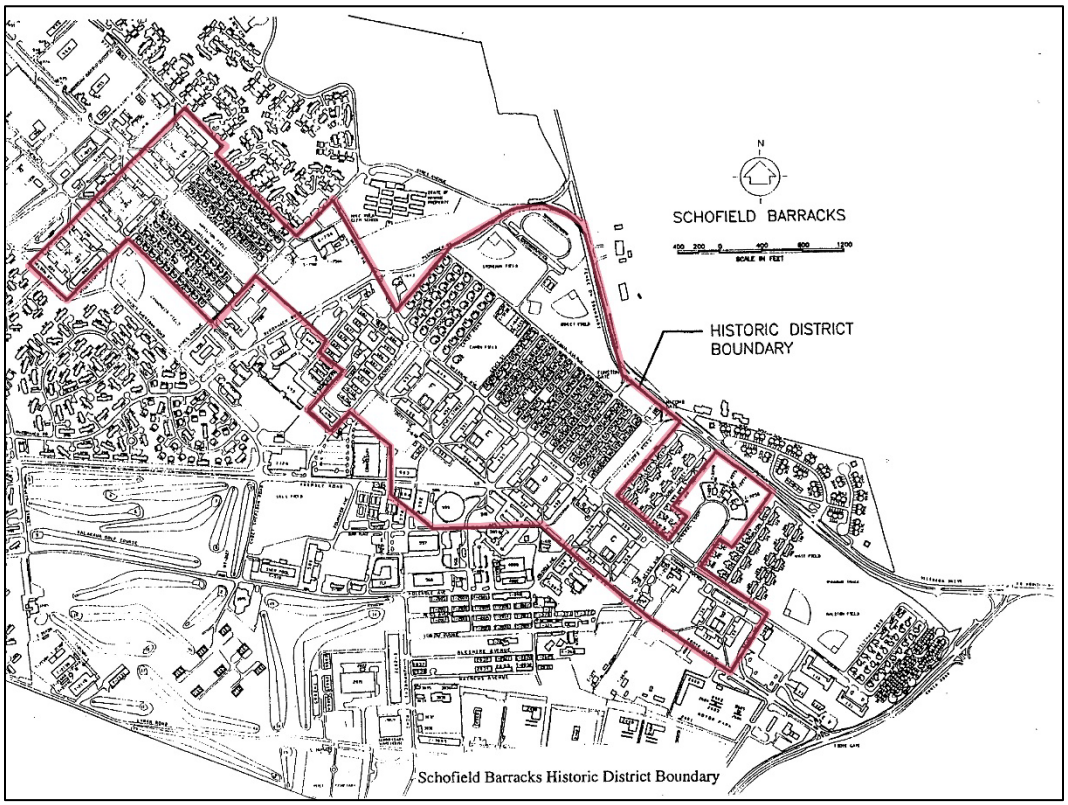
Schofield Barracks was established in 1908 to provide a base for the Army's mobile defense of Pearl Harbor and the entire island. Home to the 25th Infantry Division, Schofield Barracks is nestled at the foot of the Waianae mountain range on the island of Oahu in Hawaii and encompasses 17,725 acres. Construction of the permanent post began in 1916 and continued steadily with a hiatus for WWI and a massive build-up prior to

and during WWII. The different construction phases are apparent in building location and architectural styles. The initial base construction is rendered in the Second Renaissance Revival style; the early 1920s housing is in a Tropical Bungalow/Craftsman style; the 1930s housing areas and other buildings, such as the Main Post Office, are in the Spanish Colonial Revival (or Mission) style; and the WWII construction is mostly temporary wood buildings built from standardized plans.

The most prominent feature of the base are eight sets of large, masonry quadrangle (Quad) barracks, constructed between 1914 and 1948. Two large residential districts north and west of the Quads include buildings constructed in 1918 in the Tropical Bungalow/Craftsman style. General Loop, the only remaining of three adjacent original officers' housing loops, contains three large board and batten cottages in the Tropical Bungalow/Craftsman style.[104] For the most part, all of these homes have retained their original features on the exterior. The Schofield Barracks Historic District was listed on the NRHP on July 31, 1998 (Figure 3). The historic district includes 276 buildings, 2 sites, and 2 objects.

[104] Katharine Bouthillier, "NRHP Nomination for Schofield Barracks Historic District" (Honolulu, HI: Spencer Mason Architects, Inc. 1996).

Figure 3. Schofield Barracks Historic District (NR Nomination).



3.1.2 CRM Compliance and Consultation

US Army Garrison Hawaii has responsibility for cultural resources within Army facilities on Oahu and provides support for management of historic buildings and districts within Army facilities on the Island of Hawaii.

The Cultural Resources Office reviews proposed projects and actions in early stages of planning to identify cultural resources issues and to inform the proponents regarding the requirements that may apply. The Cultural Resources Office advises proponents as to the most efficient and effective process through which the Garrison may achieve compliance with the cultural resource's requirements applicable to specific undertakings.

The research team met with the architectural historian at Schofield Barracks. The architectural historian was not the CRM but was physically located with the master planners. The CRM, an archaeologist, was located elsewhere on post. The architectural historian believes there is a large benefit to being physically located with the master planners as it allows one to hear of projects in the works and be present on day one of the planning meetings for new construction projects.

3.1.3 Project Review Process

3.1.3.1 Request for Proposals

The Schofield Barracks staff emphasized the need for a CRM, architectural historian, or other subject matter expert to be involved in the construction process early. This is so they can assist in the writing and reviewing of the RFP. Ensuring there is a historic preservation section in the RFP, can help prevent delays later. The historic preservation section should be clearly listed in the table of contents, so it is not overlooked. In addition, it is recommended that in Section 1 of the RFP the historic preservation laws and regulations are listed and stated as requirements, not as suggestions. Section 2 should include treatment guidelines (specifying materials, doors, windows, colors, etc.). For new building construction, the Schofield barracks team advises listing compatibility requirements (this could also be listed in an appendix). In section 3, they recommend listing the Secretary of the Interior's standards as they apply to the project, historic district, and/or installation.

In addition, it is recommended that the CRM or subject matter expert carefully read the RFP looking for inconsistencies (conflicts with standards and preservation). The staff at Schofield Barracks also send the RFP (prior to generation of any drawings) to the SHPO for review. This helps to foster the relationship with the SHPO and help enable easy concurrence. They also recommend including viewsheds in RFP, as well as trees that are on city or county Exceptional Trees Lists. For archaeology, an inadvertent discovery clause should be in every report.

3.1.3.2 SHPO consultation

For DBB projects, the architectural historian is involved in the process earlier than the DB process. Schofield Barracks recommends being on the planning team from the beginning and to be involved in the design process. All architectural plans should be carefully reviewed (solar panels can be hidden in with plumbing details and not mentioned on roof details). The architectural historian has found that the design can take a year to complete with 25%, 50%, 70%, and 90% submittals of plans. The installation forwards the 90% design to SHPO. Schofield Barracks staff recommend attending every meeting for both DBB and DB projects. However, this may not work at installations where the CRM is a contractor. Since contractors cannot speak for the installation or the government, at some

installations they are not allowed to attend meetings or offer comments. Whomever is the Federal person in charge must attend the meetings and share notes with CRM contractors. In addition to the 90% plans, the letter to SHPO should state, "We will send you final elevations and site plans to show you that we follow through on our commitment." This should back up what the RFP details.

3.1.4 Projects

Building 690 at Schofield Barracks is a three-story concrete building constructed in 1929 as a medical staff barracks facility to support the nearby health clinic (Figure 4). It was a DBB rehabilitation project to preserve the 88-year-old historic building while enabling it to continue serving the Army community. Updates to the building included outfitting it with air-conditioning units and interior elevators, while maintaining its architectural features. The Moreton Bay fig tree that had been planted next to the building when it was built in 1929 also remains in place. Its roots had grown into the foundation of the building, but a professional arborist was called in to help cut back the roots and build a root barrier to prevent future damage to the building's structure. The project won a preservation award in 2017.

Figure 4. Building 690 showing large windows and balconies for airflow, 2015 (US Army Garrison-Hawaii).

The renovation and upgrades of Quad D, Buildings 450-451 and the surrounding area was a DB project (Figure 5). Project included AC systems, central plant, and upgrades to meet Army barracks criteria including ATFP hardening for close proximity parking. ATFP hardening included replacement of glazing for all exterior windows and exterior glazed doors with laminated glass. The project won a preservation award in 2015.

Figure 5. Photograph of Quad D, Building 450, 2016 (ERDC-CERL).

During the site visit, the researchers visited another DB construction project at Scofield Barracks. The Warrior in Transition Complex is only the second new construction project located in the historic district (Figure 6). The new construction includes barracks, an administrative services building, and a central plant building. The project was sited in a former parking lot adjacent to the medical center. The architectural historian on staff was involved in the RFP writing and editing which was advantageous. The project involved much consultation to reach SHPO concurrence on the project since the new construction is five stories in height and the adjacent historic barracks are three stories tall.

Figure 6. Warriors in Transition barracks complex, 2016 (ERDC-CERL).

3.2 Marine Corps Base Hawaii, Kaneohe Bay, HI

The CERL team, which consisted of a historic architect and a historic landscape architect, visited Marine Corps Base (MCB) Hawaii in October 2016 to talk with CRM staff about the construction process. After the initial meeting with the CRM, an archaeologist, the team met with three members of the Planning and Engineering Department since they were more directly involved with the construction processes at the installation. MCB Hawaii was one of the original installations to express interest in the project.

3.2.1 Background

Marine Corps Air Station (MCAS) Kaneohe Bay is located on the Mokapu Peninsula on the Northeastern coast of the island of Oahu. Construction of a naval air station (formerly NAS Kaneohe Bay) began in September 1939. By December 1941, two of five planned, steel hangars had been completed. These hangars, Hangar 101 and 102, were designed by Albert Kahn, were built to house (101) and repair (102) the station's Catalina aircraft. A rectangular area between the hangars and Kaneohe Bay measuring

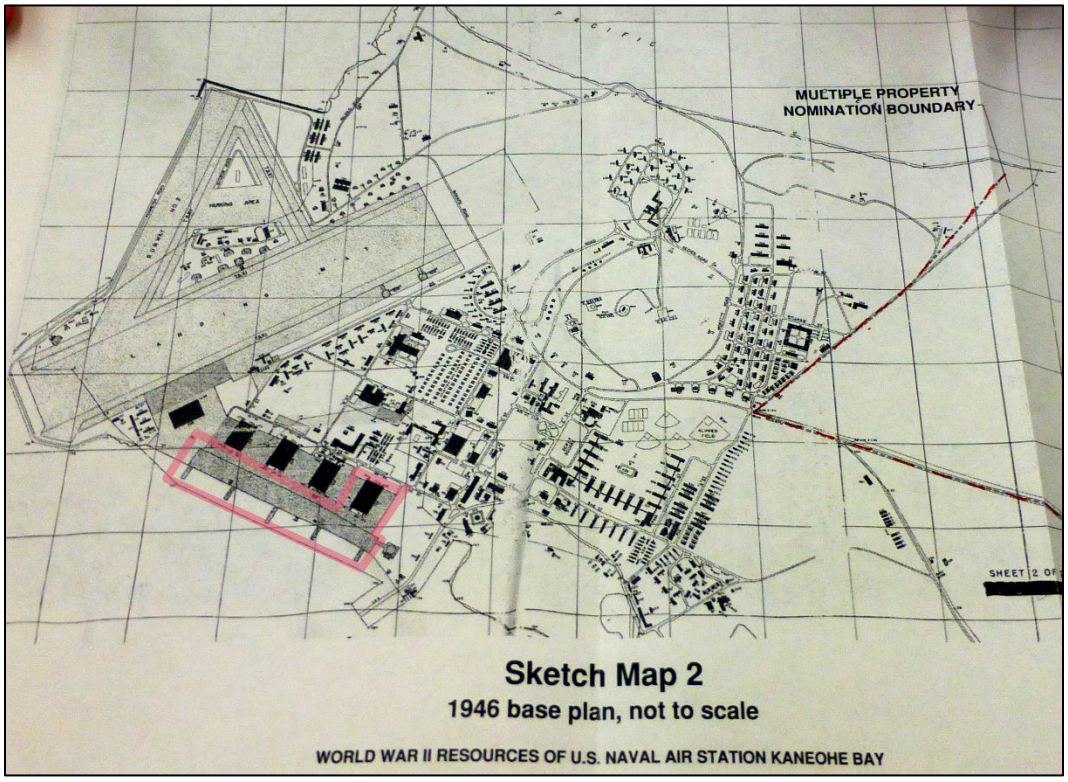
approximately 2,800 feet by 300 feet was paved to serve as a parking apron for seaplanes. Five concrete ramps led from this parking area into the bay. The contractor built a 5,700-foot land runway west of the hangars (Figure 7).

Kaneohe was bombed by the Japanese seven minutes earlier than Pearl Harbor; approximately one hour later the base came under a second attack and suffered great losses from both attacks that day. Of the 36 Catalinas stationed here, 27 were destroyed and six others were damaged, along with 18 sailors who perished in the attack. The first Japanese aircraft destroyed in action were shot down at Kaneohe. The Japanese goal was to destroy the American planes before they could take to the air and interfere with the bombing of Pearl Harbor. Hangar 101 was nearly destroyed in the attack. Hangar 101, the "parking" area between the hangars and the bay, and the five seaplane ramps are associated with the US entry into WWII.

The station was listed as a historic district on the NRHP and as a NHL in recognition of its role in WWII on May 28, 1987 (Figure 8). Both Hangars 101 and 102 are listed as contributing resources NAS Kaneohe Bay Historic Aviation District. Other historic districts determined eligible at NAS Kaneohe Bay include Officers' Housing, NCO Housing, and Administration area.

Figure 7. Arial view of Kaneohe Naval Air Station, c 1940s (aviation.hawaii.gov). Hangar 101 is located in center foreground.

Figure 8. Map showing Historic District boundary in red (MCB Hawaii).



3.2.2 CRM Compliance and Consultation

The Cultural Resources Management program, within the MCB Hawaii Environmental Department, includes management of cultural resources to support the military mission, while preserving, protecting, and enhancing these resources. Historic properties, such as archaeological sites and historic buildings, within their jurisdiction include resources at MCB Hawaii Kaneohe Bay, Camp Smith, Pu'uloa, Marine Corps Training Area Bellows, Camp Smith, Pearl City Annex, Manana Neighborhood Housing, and Waikane Valley.

The CRM at the time of our site visit was an archaeologist. The CRM is located within the Environmental Department, separate from the Facilities - Planning Department, which was why the CRM invited members from this department to be included in the site visit.

3.2.3 Project Review Process

Generally, the CRM staff at MCB Hawaii found that large expensive military construction (MILCON) funded projects are usually DB, especially since the early 2000s. Smaller special projects, minor construction, and maintenance and repair are typically DBB projects since the RFP for DB construction projects can be too vague for historic properties. Multiple change orders may be needed to meet NHPA requirements. The staff finds that if an RFP is too specific for a DB process, maybe it should have been a DBB project.

For large MILCON projects, the project team has much to do before deciding on a DB or DBB project delivery process. A DD Form 1391 is completed as well as a charrette, both in tandem with NEPA[105]. Typically, a firm is hired to complete the 1391 and host the design charrette. If authorized to proceed, then an RFP team is established. The 1391 forms for MILCON funding are initiated by the installation planners and then sent to Naval Facilities Engineering Systems Command (NAVFAC) Pacific. NAVFAC Pacific functions as the design agent and usually writes the RFPs. There is a historic architect on staff at NAVFAC to review and verify that NHPA is taken into consideration during construction. Once the contract is

[105] A DD Form 1391 is used by the DoD to submit requirements and justifications in support of funding requests to Congress.

awarded and design plans generated, the 90% plans are sent to the SHPO for review and concurrence.

The CRM relies on NAVFAC staff or master planners for new project notification and as a result, is not involved from the beginning of the process. The CRM is also not aware of whether the project is DB or DBB since the 1391 has already been completed. The project planners completing the 1391 typically know to include archaeological monitoring on the form; however, language regarding historic buildings, districts, or landscapes is frequently omitted at the installation level for smaller projects not being overseen by NAFAC. It is the CRMs task to catch these omissions.

At MCB Hawaii, the NEPA review process is how the CRM usually finds out about new projects. The NEPA process begins when a federal agency develops a proposal to take a major federal action. The action prompts an environment review. There are three levels of analysis for NEPA: 1) categorical exclusion determination (CATX), 2) an Environmental Assessment (EA) or Finding of No Significant Impact, or 3) an Environmental Impact Statement (EIS). The CRM estimates 99% of projects go under the NEPA review process at MCB Hawaii. Typically for DB projects, since the CRM has not participated in the RFP process, the SHPO does not consult on the RFP. They only consult on the undertaking. The Section 106 process is triggered by NEPA. For large projects, NEPA should be done first. For special projects, the design process starts before NEPA is completed. Usually there is no RFP for smaller DBB projects at MCB Hawaii.

Adaptive reuse or rehabilitation projects have separate funding sources, so the project is typically a CATX.[106] NAVFAC typically signs off on CATX screening. Unfortunately, the NEPA checklist has no references to historic districts, and the only information provided on mass and size is the building footprint. RFPs all have a paragraph on archaeological site monitoring and typically NAVFAC provides the contractor.

3.2.4 Projects

A new Osprey hangar (907) was constructed for the base in 2016 and was the first hangar built since WWII. It was a DBB project. A second one is in

[106] CATX is a known acronym for Categorical Exclusion. CATX is part of the NEPA process, and it is an agreed upon list of actions that do not need further NEPA review. But that does not mean the action does not need further Section 106 review.

plans to be constructed across the street from the historic district. While the CRM was showed the plans, they were conceptual sketches with no context shown. The perspective was very misleading and the impact on the historic district was brought up too late in the Section 106 process. The new hangar(s) are much larger than existing hangars near and in the historic district due to the size and needs of the new aircraft. Mitigation for the new Osprey hangar was HABS for Hangar 101.

Repairs were needed to Hangar 101, located in the NHL district, and Hangar 102. These two hangars were designed by the architecture firm of Albert Kahn, a world-renowned architect. Constructed as seaplane hangars, they were bombed during the attack on Pearl Harbor. MCB Hawaii chose the DBB process for construction because the installation feels that DBB is a better project delivery system when there are historic buildings or construction in the historic district, and the project needs to follow the Secretary of the Interiors Standards (Figure 9). MCB Hawaii consulted with the NPS for the EIS, and HABS was completed for the hangars (in 2015) as well as a programmatic agreement (PA).

Figure 9. View of Hangar 101 (on right) and Aviation Historic District, 2016 (ERDC-CERL).

Renovations to Building 215, also designed by Albert Kahn, provided a challenge for installation staff. The Administration and Operations building was constructed in 1939 and is one of three buildings at the former NAS Kaneohe that follow the International Style (other buildings on the

installation refer to the style).[107] Renovations required adherence to the Secretary of the Interior's Standards which was a challenge in consultation (Figure 10). A HABS report was created to make sure contractors were aware of historic character-defining features, so these features were not disposed of during the construction process. Project was a bid bust at the time of site visit, but recent work on the historic building has included new windows, HVAC, and new exterior stairs.

Figure 10. Building 215 before renovations, 2016 (ERDC-CERL).

3.3 Naval Base Kitsap, Bremerton, WA

One CERL team member, a historic landscape architect, visited Naval Base Kitsap-Bremerton in November 2016 to talk with the CRM about the construction process. This installation was selected for the project because Naval Base Kitsap wrote a letter of support for the project. Naval Base Kitsap command wanted case studies to better understand construction delivery systems. In addition, the command wanted to contribute to the creation of a practical guide that CRMs and other stakeholders involved in historic building construction can utilize to ensure efficient and successful compliance with Section 106. Photographs were not allowed during this site visit for security reasons.

[107] Dee Ruzicka, *HABS, US Naval Air Station Kaneohe, Oahu, Administration and Operations Building (Facility 215)*, (Washington, DC: Historic American Buildings Survey, National Park Service, 2015), 23.

3.3.1 Background

Naval Base Kitsap (NBK) is the largest naval organization in Navy Region Northwest. Located on the Kitsap Peninsula in Washington State, it was established in 2004 by merging five naval installations under one command, including Naval Station Bremerton, Naval Submarine Base Bangor, Naval Undersea Warfare Center Keyport, Manchester Fuel Depot, and Jackson Park Housing. NBK-Bremerton was first established as the Puget Sound Naval Station in 1891. The first major structure, Dry Dock 1, was completed in 1896. Designated as Navy Yard Puget Sound in 1901, the shipyard operated as a repair facility until WWI when the mission expanded to shipbuilding. During WWII, the shipyard reduced its shipbuilding capacity to smaller warships and reserved its facilities for vessel repair. After WWII, the mission changed from repair to deactivation of fleet vessels and modernization of aircraft carriers. At this time, the name was changed the Puget Sound Naval Shipyard. During the 1950s, the shipyard entered into a new era of construction by building two guided missile frigates. The shipyard underwent a new building construction program in the 1960s and was designated a submarine repair facility. In the early 1970s, the Shipyard went through a modernization program resulting in major changes in the facilities capabilities and appearance. Today, the shipyard is the largest and most diverse shipyard on the West Coast.

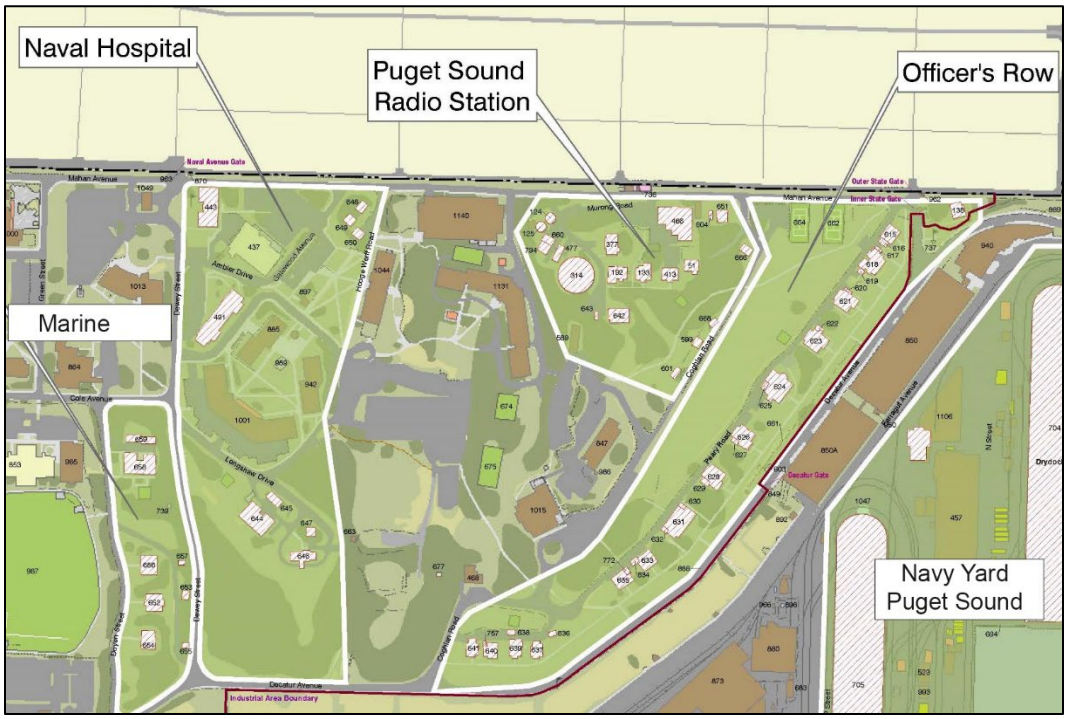
In 1990, the eastern portion of the shipyard was determined to be eligible for the NRHP. The Navy Yard Puget Sound NHL District, which includes 22 buildings, five dry docks, and associated structures and piers, is located within the Controlled Industrial Area at the shipyard (restricted access). The NHL period of significance (POS) is 1938 – 1945 under Criterion A for large warship repair and construction during WWII. In 2018, a survey of historic buildings within the Controlled Industrial Area identified a NRHP-eligible historic district, the Puget Sound Naval Shipyard Historic District, with the same boundary as the Controlled Industrial Area. The contributing resources to this historic district span the period between the purchase of the site and the end of the Cold War. Resources built within the Controlled Industrial Area during this POS hold significance under one or more of three historic contexts: 1891–1945, Cold War, and Naval Shipyard Architecture.

There are four additional historic districts at NBK-Bremerton which include the Officers' Row Historic District, the Puget Sound Radio Station Historic District, the Hospital Reservation Historic District, and the

Marine Reservation Historic District (Figure 11). The Officer's Row Historic District contains residences built from 1896-1913 to provide housing for shipyard officers. The Puget Sound Radio Station Historic District is significant because of the buildings associated with radio communication at the Puget Sound Naval Shipyard from 1894-1941. The Hospital Reservation Historic District encompasses the remaining buildings, built between 1923 and 1942, of the Naval Hospital established in 1909. The Marine Reservation Historic District includes the remaining four residences, the associated barracks has been demolished, constructed 1911-1914 to house the Marine detachment providing security for the Navy Yard.

Figure 11. Aerial photograph of Puget Sound Navy Yard, 1932 (Naval History and Heritage Command).

Figure 12. Historic Districts at Naval Base Kitsap-Bremerton (NBK).



3.3.2 CRM Compliance and Consultation

Naval Base Kitsap falls under the NAFAC Northwest regional office and consists of facilities at Bangor, Bremerton, Keyport, Manchester, Shelton-Bangor Railroad, Zelatchet Point, Camp Harris, and Camp McKean. NAFAC Northwest has offices at NBK-Bangor. The CRM at the time of the site visit was a landscape architect physically located at Bremerton. The CRM was located with the Public Works Department. An archaeologist was also on the cultural resources staff but was physically located at Bangor. The regional office, NAFAC Northwest, had two archaeologists and an architectural historian on staff for cultural resources support.

3.3.3 Project Review Process

At NBK, new projects are assigned a category code from 1-4 depending on project size. Category 1 projects are large projects which require lots of engineering, sometimes MILCON funded. These projects go immediately to NAFAC level. NAFAC planners and engineers manage the contracts and write the scope of work, both for DBB and DB. A draft of these documents is sent to the NEPA manager for review. The NEPA manager sends them out to installation environmental level. For larger rehabilitation projects, both DBB and DB, a contractor may be hired to write a cultural resources

report detailing the character-defining features of the historic properties in the project.

Category 2 projects usually stay at installation level, although they can go to NAFAC level. Projects are usually smaller new construction or rehabilitation projects which require less engineering than Category 1 projects. CRM consults on these projects.

RFPs for DBB and DB are completed for both Category 1 and 2 projects. The RFP for DB is in six parts, and it is recommended that some or all sections should include historic preservation when dealing with historic properties. Section 6 should include Secretary of the Interiors Standards, any survey reports, and any buildings reports. The RFP for DBB is in five parts and includes a design. At least one DB project the CRM worked with included a few plans in Section 6 so that SHPO could review, but this is not always the case.

CRM consults on some Category 3 projects. These are small projects around the installation requiring no engineering and having short scopes of work (8-10 pages). These projects are usually funneled to a base contractor from facilities management. These projects typically do not have plans to review, so CRM consults on a concept. Category 4 projects are typically a service calls to public works. These can be as simple as replacing a doorknob or a light bulb and require no consultation by CRM.

According to CRM staff, the challenge with DB projects is that the contracts are usually given to construction companies that may choose to hire out for design services. These two entities may have competing interests. In DB projects, the risk goes to the contractor more than the government, and the concern is that they want to save money and to do that they may discourage input from others. Typically, DB works well when CRM is confident there is no adverse effect.

3.3.4 Projects

The retrofit and renovation of Building 431, a machine shop constructed in 1933, to current structural and seismic standards identified after an earthquake in 2001. The project included the demolition of a significant part of the building interior, renovation of all architectural, mechanical, and electrical systems, and hazardous material remediation. It was a MILCON funded DBB project and a Category 1 project for NBK-Bremerton. The

557,000 sq. ft. building is located in the Controlled Industrial Area. DBB was chosen because of the need for geotechnical surveys prior to development of plans. A contractor was hired to write a cultural resources report detailing the character-defining features of the building which may have been impacted by the construction. The report was sent to SHPO with an adverse effect letter. The adverse effect prompted the need for an EA for the historic property which added an extra year and substantial costs to the project. Due to the adverse effect, the CRM invited the SHPO to walk the site with the A/E firm and contractor to show and explain their choices. Historically, any adverse effect required an EA, but recent changes and the implantation of CATX have changed that. The NHPA and NEPA recommendations by the ACHP says if mitigating with a memorandum of agreement, an EA is no longer necessary.

Building 147, the foundry, also located in the NHL district and in the Controlled Industrial Area, was selected for roof and seismic upgrades as part of a larger energy efficiency project. Initially constructed in 1912, the east half of the building was added in 1939. CRM was involved early in the project with hopes of avoiding an EA. During the initial consultation with SHPO, they concurred on the energy efficiency modifications. SHPO was then provided with 35% plans to show no adverse effect. The NPS was cc-ed on all SHPO consultation but did not comment. This was a DB project that first accrued issues when the contractors ripped off the roof and realized it needed to be reconstructed. In addition, a historic lintel, a character-defining feature of the building, was destroyed during construction which required a request for information on the lintels. Consistent monitoring by CRM ensured the lintel was rebuilt correctly. The project team was committed to a no adverse effect determination, and they were successful.

4 Case Studies

4.1 Design-Bid-Build, New Construction

The Texas Army National Guard (TXARNG) initiated a plan to construct a new information technology network operations facility in 2007 to support statewide military functions. Because the structure would be located along a central service road, within the Camp Mabry Historic District and State Antiquities Landmark in Austin, Texas, there were significant regulatory processes to follow for Federal and State preservation laws. In the state of Texas, the SHPO is located within the state agency called the Texas Historical Commission (THC), so this case study refers to the THC to discuss both the Federal and State regulatory components. This example demonstrates how the Cultural Resources staff of the TXARNG worked through the DBB Process to implement a successful coordination with no adverse impacts to historic integrity within District or negative impacts to construction timeline and mission readiness.

4.1.1 Background on TXARNG Cultural Resources and Construction Facilities Management Office

Army National Guards are unique entities within the DoD. Many of the civilian staff employed to provide support to soldiers are state employees who are Federally reimbursed via agreements that allow a state agency entity tasked with administrative and management oversight (in this case, the Texas Military Department, an agency funded via State and Federal dollars). In the TXARNG situation, the Environmental Branch is organizationally part of the Construction Facilities Management Office (CFMO). The CFMO is the equivalent of a Directorate of Public Works found in other services such as the Army. The Cultural Resources Program is located within Environmental Branch and via their ICRMP implements a preservation program focused on efficient management of historic resources in support of TXARNG mission readiness.

Achieving this balance between mission readiness and preservation is done with an intense focus on early coordination and communication throughout the CFMO, from the initial planning and programming of TXARNG facilities needs to work with the design branch and construction project managers through life cycle of a project to keeping up with the requests and work of the maintenance branch.

TXARNG command works through their strategic planning for facilities via the Real Property Planning Board, a quarterly gathering of decision makers who are briefed on TXARNG facility needs and mission requirements and are tasked with prioritizing programming dollars for the CFMO. The TXARNG Cultural Resources program staff attends these meetings which allows them to track the planned projects for the state and identify very early on when and where their participation will be required in project development. In this way, the cultural resources staff can inform the CFMO branches when they will need to be involved with a project.

Most major construction and rehabilitation projects at TXARNG are funded from Federal dollars although the State of Texas does provide a share on some buildings, particularly those with components funded by the state, for example the State Guard. As a result, most of the contracts are handled via a state agency contracting office, not via the US Property and Fiscal Officer as is found at Federal installations. As with any public agency, this means the implementation of projects must comply with the state procurement procedures, regardless of funding source. There are naturally implications from such processes as will be seen in this example.

Going back to the funding stream from the state briefly, in 2001, a special state bonds program allowed for a large number of rehabilitation projects specifically for historic buildings. Given that TXARNG's headquarters, Camp Mabry, is a state-owned facility, it was possible to complete several needed historic rehabilitations with these dollars. It was during this period that the TXARNG cultural resources office began to work closely with CFMO on ensuring projects initiated on historic structures would include a member of the cultural resources office as a project team member, not just a regulatory reviewer handling the procedural reviews with the SHPO, even though with only a year to year contracted position in place, their role would remain primarily as a "consultant" since they were not a full state employee.

4.1.2 Background on Federal and State Historic Preservation Coordination

TXARNG, like other state guards, is unique in having Federal and State components, funding streams facilities and lands. This distinguishes it from other DoD services, where most properties and funding are Federal. To understand the case study, it is therefore important to briefly summarize the TXARNG preservation responsibilities on State properties.

In 1969, the Antiquities Code of Texas was enacted to protect archeological sites and historic buildings on public non-Federal land. It requires state agencies, cities, counties, river authorities, municipal utility districts, and school districts to coordinate with THC when there was any ground-disturbing activity on public lands and/or undertakings affecting publicly owned historic buildings. The law also created a process for designating a State Antiquities Landmark, which may be applied to historic buildings and archeological sites (Texas Natural Resource Code, Title 9, Chapter 191) and accompanying Rules of Practice and Procedure (Texas Administrative Code, Title 13, Chapter 26).

TXARNG has a variety of properties on state lands, which means there can be both Federal and State coordination required. Federal coordination is of course required if Federal dollars are part of a project or Federal components are present (for example, the CFMO are tenants at Camp Mabry, a state-owned facility so there are dollars tied to maintenance, utility costs, etc.). Likewise, if a project only involves state funds on state property, such as the Texas State Guard renovating a state-owned building, the coordination would be under the Antiquities Code and not the NHPA.

4.1.3 Case Study Background

In October of 2006, the TXARNG Architectural Historian Theresa de la Garza was working with CFMO staff on another project when they informed her of the plans for new construction at Camp Mabry. After speaking with them, she prepared a significant documentation email which is summarized as follows (original on file with Camp Mabry Building 18 archives):

1. The proposed footprint of Building 18 lies within the Camp Mabry Historic District's boundaries.

2. Camp Mabry is a National Register Historic District, requiring compliance with the NHPA. It is also a State Archeological Landmark, obligating us to meet the Texas Antiquities Code requirements. The latter is the most stringent. The state National Guards have to adhere to state preservation law as well as national preservation law.

3. The cultural resources office will handle the regulatory coordination for both federal and state laws. It is imperative that cultural

resources staff remain involved from pre-design through construction completion as part of this coordination.

4. All proposals of ground disturbing activity within the District must be reviewed by the CRM to ensure no archaeological sites are disturbed.

5. All new above ground construction within the District's boundaries must be reviewed by cultural resources office as it usually requires a State Antiquities permit.

6. For the investigative report for Type A (Investigative Design) services, it is important to reference the Historic District status.[108] In this pre-design phase, the State Historic Office will want to see the historic district considered in design solutions.

7. Since formal design guidelines for the Historic District do not exist, the Natural Resources Program will provide landscape guidance. Attributes which have the potential to impact the Historic District include building scale, roof form, exterior material (color and type), materials, architectural style, massing on the site, setbacks, pattern of fenestrations, location of entry, signage, visibility of HVAC equipment and utilities, and location of parking.

8. The requires a THC minimum 30-day review period for all submittals. The cultural resources office will coordinate the submission of all deliverables, from the Investigative Report, through the 35% to 100% completion submittals. The permit application review period is 60-days, although it generally can have a shorter turn around.

9. Because a permit is required, it is best to allot for this review period in the project schedule. In cases where the time is limited, as with this project, cultural resources office will likely apply for the permit with the 65% completed documents. Therefore, the portions of the design which most affect the District should be as fully developed as possible by this stage (see #7 above).

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[108] Type A, B and C are used in contracting A/E firms for the initial or investigative design phase (Type A), the design phase (Type B), and the construction inspection and testing phase (Type C) of a construction project. For more information see the ANG Whole Building Design Guide (ANGETL 10-03 Air National Guard Design Objectives and Procedures).

10. The CFMO will be supplied with the permit application and supporting material, so that the architect of record can provide the Project Professional's Certification. The certification does require a familiarity with the THC's Rules of Practice and Procedure and the Secretary of the Interior's Standards for the Treatment of Historic Properties. Both of these can be found online. The cultural resources office can help interpret the regulations, which are minimal in regard to new construction (i.e., design compatible to the historic district, project meets 'contract documents' and construction abides by permit conditions).

11. The cultural resources office role is as a preservation consultant. Although the office can provide suggestions and alternative options, the office cannot give direction to the A/E team or contractors. The architectural historian will review all submissions, as outlined in the Type A (Investigative) & B (Design) contract. Additionally, the cultural resources office is responsible for submitting additional copies to the THC for review and comment. All communications will either go through Project Manager or they will be copied.

12. Should the agency decide to contract for the optional Type C (Construction Inspection and Testing) services, the cultural resources office will ensure the design team is aware of responsibilities regarding the permit.

The TXARNG cultural resources office provided this process list as a way to set parameters for the course of the project so that the CFMO could clearly understand the timelines and role of the architectural historian. This email was presented at a time when TXARNG cultural resources office was working hard to educate the agency about the Camp Mabry Historic District. Having only been nominated and listed in the late 1990s, and with the first ICRMP only a few years old, it was necessary for the cultural resources office to be proactive and direct in providing support and guidance on projects.

4.1.4 Design Background

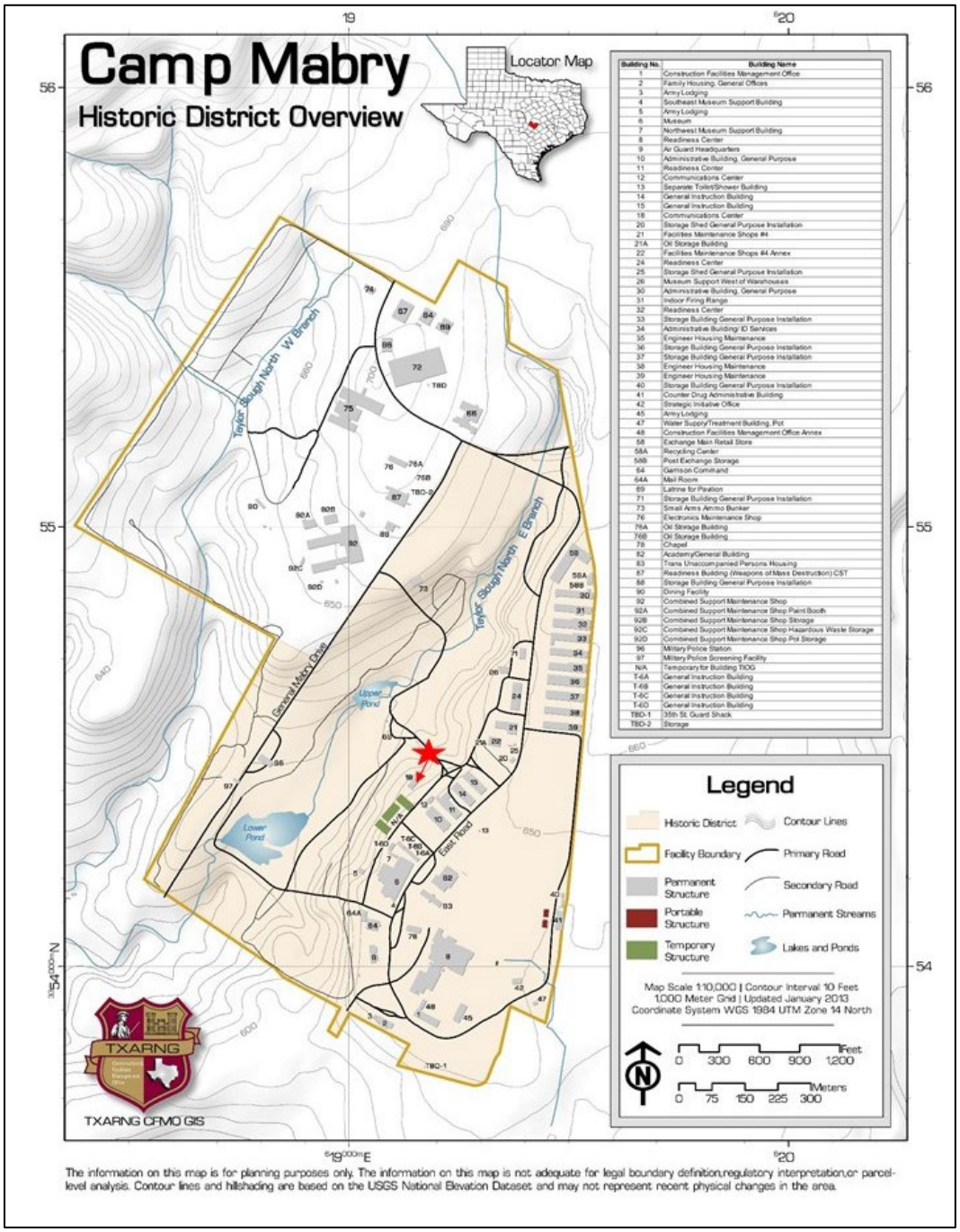
The new Information Technology Network Facility building was proposed to replace an existing facility. Because the proposed new building was to be located in an open area essentially in the "back yard" of the Camp Mabry

historic district (Figure 13). The total area of the new building was approximately 3,500 sf. The location was selected based on two factors: 1) Proximity to an existing data/communications duct bank and vault running to the west of Building 12 (the old Information Technology building), and 2) Maintaining appropriate force protection stand-off distance as required by National Guard Bureau. As can be seen in Figure 2, it happened to be fortunate coincidence that these requirements meant the new building would automatically be located in a less prominent area of the Mabry historic district, otherwise additional design details in the exterior would have been taken into consideration.

The project's area of potential effect (APE) was included in the 275-acre archeological survey conducted by the Texas State University Center for Archeological Studies (October and November of 2001). No archeological sites were identified within the APE.[109] Furthermore, a review of the Texas Archeological Sites Atlas indicated that no archeological sites had been recorded within the APE subsequently. The ICRMP in place at the time of this project included a Standard Operating Procedure (SOP) for inadvertent discoveries that would be disseminated to the project personnel (CFMO staff and contractors conducting work) to cover any potential event where archeological materials were encountered during construction. The SOP outlined process for ceasing activity and notifying appropriate personnel for investigation prior to beginning further disturbance. This SOP provided compliance with NHPA as well as ARPA and NAGPRA.

[109] Richard S. Jones and John J. Leffler, "Phase 1 and II Archaeological Investigations on Camp Mabry, Travis County, TX" (San Marcos, TX: Texas State University, Center for Archaeological Studies, 2003).

Figure 13. Map of Camp Mabry Historic District (Building 18 is marked with red star and arrow) (Texas Military District Integrated Cultural Resource Management Plan 2015-2020).



The Architectural Historian provided the contracted architects with the historical summaries of Camp Mabry and accompanied them on site visits to view the District to allow them to understand the materials, forms, scales, and building types present to guide them in their design for new structure. Particular care was taken to design a facility that would be a

good neighbor and complement to the existing buildings (Figure 14 - Figure 15) in the Historic District, and at the same time provide a functional and pleasing work environment with an identity appropriate to its use as a data center. The Information Technology building function required that half of building be used for administrative offices while the other half needed to meet the unique requirements for supporting network and information technology equipment.

Figure 14. Site location of proposed Building 18 prior to construction [Note WWI-era brick buildings opposite site location. Building 22 is the light gray roof in top left of picture (northeast of site).], 2017 (Texas Military Department).

Figure 15. Site location of Building 18 post construction [the building in the red box], 2017 (Texas Military Department).

4.1.5 Challenges Encountered and Design Solutions

The Mabry District in the vicinity of the project area has two primary historic building types dating to 2 different periods. The first era of construction at Mabry occurred during WWI and the remaining structures are primarily two-story yellow/buff brick buildings that served as barracks, offices, and mess halls when built and now are housing administrative offices and the museum. Several modified wooden hangars to support a School of Automobile Mechanics at Mabry were also built during this period but only two of those buildings remained at time of this project. A second phase of construction roughly associated with the Depression period and World War II saw several limestone buildings and features added to the post. Later buildings in project area used a split-face CMU that approximated the limestone look of the older buildings. Most roof forms are gabled or hipped, with some gambrel roofs, and either composition shingles or galvanized metal.

It was important for the new building to be distinct yet subtle within a District containing different styles and periods of construction. Therefore, a number of design decisions were made taking consideration of the existing building materials and designs. During this phase of design, the architectural historian was critical in providing the A/E firm with the background

histories and conditions of the buildings, old photographs and coordinate any required input from the State Historic Preservation Office.

Split-face CMU walls and galvalume (55% Aluminum-Zinc alloy coated sheet steel) standing seam gabled metal roof were chosen as appropriate materials for the new building. An example of this same construction, Building 22, is visible from the Building 18 site (Figure 16). Building 12 has CMU walls and a metal roof (Figure 17). The Building 18 walls have a base course of CMU that would be a shade darker to replicate the weathering and discoloration that often occurs naturally on the lower portions of both limestone and CMU. The galvalume roof was selected as it will gradually patina to a light grey color matching the other roofs in the district.

Figure 16. Existing Building 22 (built c. 2001) with split face cast stone walls and metal roof located near APE, 2017 (Texas Military Department).

Figure 17. Existing Building 12 (built c. 1942) with CMU walls and metal roof located near APE, 2017 (Texas Military Department).

The fenestration on Building 18 takes its cue from the many support buildings in the district. Windows and doors infilled into what is essentially a rhythm of bays. An exact replica of this bay door rhythm as well as the gable roof form is within view of the site, in the form of Building 26 (Figure 18). This motif is predominant throughout Mabry, and many other examples occur around the District and are most evident in the row of 30-series warehouses built in the early 1930s (Figure 19).

Figure 18. Existing Building 26 (built c. 1942) with limestone walls and shingle roof located near APE, 2017 (Texas Military Department).

Figure 19. Buildings 35 (1943) and Building 36 (1943) with limestone walls and metal roofs, 2017 (Texas Military Department).

Where windows occur, they are paired, as is typical on many buildings in the District (Figure 20). The windows incorporated shading devices to comply with current sustainability practices. These would be thin perforated metal shades on galvanized metal brackets reminiscent of many others on the base. The metal brackets would also take their cue from the eave

brackets occurring on many of the historic barracks, such as Building 10 (Figure 21).

The building entry, as can be seen in Figure 21, is protected from the elements with a curved metal canopy inspired by the typical side entries on the original barracks buildings. The entry canopy is not physically connected to the building for purposes of constructability (hard to tie in) as well as design (helps define entry).

Figure 20. Windows and roof types in adjacent Building 6 (built 1918), 2017 (Texas Military Department).

Figure 21. Windows types and entrance in adjacent Building 10 (built 1918), 2017 (Texas Military Department).

The site work proposed was minimal, with consideration given to natural and cultural resources (i.e., native and adapted vegetation, historically typical sparse plantings). As noted previously, the parking and building location was driven by force protection requirements and the need to be close to the communications vault. A masonry wall screens the loading and service area from the service road, as well as limiting visual impacts to District Road.

In summary, the overall approach was to be as restrained and understated as possible, while still complying with the functional needs of a modern network facility. The form, scale, materials, and specific design motifs were drawn from historic support buildings within the district and within sight of this building location. The building would blend carefully with its neighbors.

4.1.6 Design-Bid-Build Process for Building 18

The project followed a standard DBB process to execute the new construction. In this setting, a RFP was set out via the state contracting office, a civilian branch of the agency and interested firms submitted bids and qualifications based on the Scope of Work described in the RFP. Once the

A/E firm was awarded the Type A services, they went through a process of design submittals to the TXARNG. With the acceptance of the 100% design submittal, bid documents were issued to award to a GC to handle execution of the new construction. Table 4 shows the timetable the TXARNG established for project.

Table 4. Design and Award Schedule for Building 18 New Construction (Texas Military Department).

Action	Duration (days from prior event)
A/E Agreement Signed	--
Type A	70
35% Design Submittal	56
65% Design Submittal	42
95% Design Submittal	42
100% Final	14
1st Advertisement GC	2
Begin Issuing Bid Documents	1
2nd Advertisement	7
Pre-Bid	10
Last Day Bidders to Submit Questions	14
Last Day to Issue Addendum	2
Bids Open	7
A/E Recommendation for Award	4
Award of Contract	15

TXARNG generally awards several multi-year design contracts to firms to secure their services and expedite initial design and planning for projects. These are often referred to as IDIQ (Indefinite Delivery/Indefinite Quantity) within Federal Contracting, but state agencies also have similar mechanisms to quickly access services when funding arrives. They can also be used to provide general project management, mechanical and/or civil engineering services, environmental services, and sometimes GC services. In these awards, generally for between 3-5 years, agencies set the requirements for the services required and bidders then submit qualifications and experience. Because there is no actual project to submit cost proposals for, these contracts are awarded not on basis of low cost, but the skill sets of the contractors bidding. Once a contractor is awarded the IDIQ or its equivalent on the state side, the next step is to wait for a project to be

funded at which point the Agency will go to the contractor with a SOW specific to the project and ask for a proposal from them to complete. If the cost and proposal are satisfactory, the agreement is signed, and the project begins in earnest.

For this particular project, the TXARNG cultural resources program's architectural historian was informed of the project prior to the A/E agreement signature. This provided the opportunity to ensure historic preservation issues were considered from the earliest stages of the project inception. From that point on, the architectural historian served as a member of the TXARNG project team, sitting in on the meetings through the design process and providing guidance and recommendations on the project to ensure regulatory coordination, under Section 106 and the Texas Antiquities Code, went smoothly and with no adverse impacts to the project timeline.

Within the Antiquities Code process, the permit application usually is not submitted until design has reached 95% to ensure the full project impact can be reviewed by the THC Architectural division and committee. The details provided by the TXARNG architectural design team were critical to ensuring the new construction permit would be issued without further discussions and adjustments to design.

After issuance of the permit and a no adverse effect determination under NHPA, the TXARNG architectural historian did not retreat back into the Cultural Resource office and assume work was completed. Ms. De la Garza continued to participate as member of project team, monitoring and documenting the new construction. The State Antiquities Code requires that State Antiquities Landmark Permits be closed out with a Completion Report, documenting the project's completion, and tracking any alterations to original permitted plans or inadvertent discoveries, which are common in any building project. While this was different than a rehabilitation project where it was very critical to have the TXARNG architectural historian be present at all progress meetings to comment and review changes to construction, she still remained active in tracking the project and ensuring no major changes occurred that would require a notification to the THC to alter permit conditions. This allowed her to submit an extension request early on to allow for an additional six months to be added to existing permit to allow proper documentation and submission of the completion

report due to small timeline delays in construction. The completed Building 18 is visible in Figure 22 and Figure 23.

Figure 22. Completed Building 18, 2018 (Texas Military Department).

Figure 23. Looking north at Building 18, note that it is in a less prominent area of district and sits lower than buildings to the center and right of picture to be less obtrusive to overall district view, 2017 (Texas Military Department).

4.1.7 Analysis and Recommendations for New Construction

The concept of new construction requiring historic coordination is often a hard concept for non-preservation professionals to understand. In

situations where there are historic districts that lack established design guidelines or have not been made more visible to the tenants and public at an installation, it can be challenging for a cultural resource professional to insert themselves into the planning and project teams. Because the TXARNG architectural historian had established communications on a regular basis with internal stakeholders in the construction and facilities maintenance branches, it was more likely that information was provided that would alert the cultural resources program to projects requiring input and regulatory coordination. As a result, there are several recommendations to ensure successful outcomes like Building 18.

Facilitating awareness of historic preservation requires cultural resource programs to be proactive and not just reactive and limiting communications with internal team members when regulatory coordination is required. Outreach materials for installation personnel and the public can improve awareness related to historic districts and also can be a pathway to education on the guidelines and requirements for modifying or construction within them. It goes without saying that any type of knowledge is power and when everyone is educated on the reasons historic districts or buildings are protected, chances are activities impacting them will enhance rather than detract.

4.1.8 Guidance and Pamphlets

TXARNG worked to improve awareness of the Camp Mabry Historic District via production of materials for the general public as well as soldiers. The Camp Mabry Walking Tour brochure was one of the first documents produced by the CRM program to highlight the history of the Historic District. In its third edition, the brochure is used by the command, the Texas Military Forces Museum, and CFMO staff as an introduction to the history of the District and enhances pride and awareness of the preservation principles.

After attending a 2006 DoD Historic Buildings conference funded by the DoD legacy program, TXARNG also was able to network with professionals at other installations. At installations like Fort Bliss, tenants of residential quarters are provided booklets on maintaining and managing their historic residences. These booklets provide guidelines for landscaping and decorating the exterior of houses. They also saw examples of design guidelines, such as the general DoD guidelines and more specific examples such as Fort Bragg's Historic District design guidelines. Based on those

examples, TXARNG has created basic fact sheets to provide tenants of historic buildings so they can have easy access to guidance on what is allowed and what requires coordination. For example, many of the historic buildings have interior walls with historic brick exposed. It is important to explain why mounting pictures or objects on those walls is discouraged and should be coordinated with the CRM office.

4.1.9 Internal Training

The CRM office at TXARNG saw the importance of initiating training on Federal and State requirements for historic preservation specific to buildings and developed a series of briefings to provide to construction and facilities maintenance personnel on a regular basis. While these trainings are not mandated, they are conducted as needed and are available for CFMO staff to review via the internal network. Providing regular training on the regulations and how they are implemented at the agency can keep internal stakeholders aware of the support role CRM provides in ensuring compliance.

4.2 Design-Build, Rehabilitation

The TXARNG initiated a plan to rehabilitate a historic limestone warehouse in the Camp Mabry Historic District and State Antiquities Landmark in Austin, Texas in 2017. The designation as both a Federal and State historic property requires significant coordination with the THC, the agency where the SHPO is located. This example demonstrates how the Cultural Resources Program staff of the TXARNG worked through the regulatory challenges when dealing with a project facing funding and timing challenges along with a unique construction process. The end result is a successful project but there are some useful lessons learned to share for those embarking on unique projects incorporating DB and self-help.

4.2.1 Background on Self-Help Projects

The term “self-help” is applied to DoD projects that are completed with in-house labor with no contract with a vendor. For many large installations, self-help is an economical and effective way to complete generalized maintenance and repairs with soldiers and/or civilian employees. Depending on the complexity of the proposed project, there may be a designated qualified professional to serve as a project manager, such as an in-house architect, engineer, or construction project professional.

Examples of self-help range from tasking soldiers on simpler tasks such as painting facilities, cleaning up landscaping to more complicated projects such as demolishing buildings or structures, cement pouring and site work, and actual construction. These projects are often used as training for specialized engineering units or as methods to keep soldiers occupied during slow periods in their work schedules. While this type of labor is certainly economical, it can pose challenges for projects requiring highly specialized and skilled work, particularly historic projects.

4.2.2 Building 38 Historical Significance and Coordination Background

The warehouse was part of ten architect designed motor storage buildings related to Works Progress Administration (WPA) project # 50436 of 1941 (Figure 24). Evaluated for NRHP significance in 1996, the warehouses were all designated contributing elements to the Camp Mabry Historic District in the NRHP listing.

Figure 24. Camp Mabry WPA warehouses under construction, circa 1942 (Building 38 marked with arrow) (Texas Military Department).

Fort Worth architect Wyatt C. Hedrick designed these buildings, while the Ransdell Construction Company and WPA workers built them. Hedrick located the motor storage buildings (Buildings 30 through 39) on the parade

ground's northern "peninsula," paralleling the tracks of the Great Northern railroad, and across the road from the wood-frame workshops. The ashlar limestone exteriors are typical of Central Texas construction of the period, as is the hollow tile wall construction. The Federal government (War Department) took control of six of the buildings (Buildings 30-36) soon after their completion and ordered alterations to accommodate specific light and ventilation needs. That is why the south elevations of storage buildings closest to the parade ground still have the "open," full-height, sliding, corrugated metal doors, and the south elevation of the other storage buildings have been in-filled with concrete block or concrete hollow tile and various window/door configurations. Building 38 retained the corrugated metal doors.

Modifications to the building since its original instruction included installation of a garage door opening on the northern elevation in the middle of the building along with two small windows (unknown date, but prior to the 1990s NRHP evaluations) and construction of makeshift offices and loft in the interior space of warehouse. At some point, a portion of the northern limestone wall had also been removed to facilitate mechanical equipment, which was then covered with plywood.

As summarized in a previous case study on new construction (Building 18 at Camp Mabry), TXARNG has an unusual state coordination requirement for permitting when working within a State Antiquities Landmark that is an additional piece added to the standard Section 106 NHPA coordination. In 1969, the Antiquities Code of Texas was enacted to protect archeological sites and historic buildings on public non-Federal land. It requires state agencies to coordinate with THC when there is any ground-disturbing activity on public lands and/or undertakings affecting publicly owned historic buildings. The law also created a process for designating a State Antiquities Landmark, which may be applied to historic buildings and archeological sites (Texas Natural Resource Code, Title 9, Chapter 191) and accompanying Rules of Practice and Procedure (Texas Administrative Code, Title 13, Chapter 26). The code has a strict requirement, written in code, to submit permit applications 60 days in advance of construction beginning. This means the TXARNG must move quickly to provide detailed design plans, Scope of Works, specifications, historic structure reports and other supporting documentation with the permit application with enough lead time to allow adequate review time for the THC.

4.2.3 Building 38: Fast Track and Limited Budget

The initial planning for Building 38 rehabilitation was driven by a need to relocate tenants from another historic building planned for its own rehabilitation and occupation by new TXARNG tenants. With very limited budgets available and an equally short timeframe, the CFMO had to find the best and lowest cost options to prepare administrative space for occupation.

Several years prior, the CFMO had completed a successful rehabilitation of one of the 1941 WPA warehouses, Building 37, converting an underused space into a functional office for a portion of the CFMO employees. Because the employees facing relocation were in fact the other half of the CFMO office, it was determined that relocating the rest of the office to an adjacent warehouse, Building 38, would be the best course of action (Figure 25).

Figure 25. Building 38 west elevation pre-rehabilitation, 2017 (Texas Military Department).

Building 38, at the time, was being partially used as a space for maintenance employees to store equipment and workshop areas. Makeshift office spaces and platforms had been built inside of the structure in the 1970s-1980, prior to the NRHP designation (Figure 26 and Figure 27). However, since most of these structures were freestanding and temporary in nature, it was determined that it would be relatively simple to clear the building and convert it into office space, as had been done with Building 37.

Figure 26. Building 38 interior with office spaces in loft (upper left) and main floor (lower right), 2014 (Texas Military Department).

Figure 27. Building 38 prior to rehabilitation showing built in offices abutting historic stonework. These modifications were likely made sometime between 1960s and 1980s, prior to the building's historic designation, 2014 (Texas Military Department).

As funding was limited and timelines were tight, the CFMO project manager planned to utilize troop labor to conduct the initial demolition of the makeshift materials inside the building. A prior rehabilitation at a different warehouse (Building 32) had successfully used troops to demo interior materials on a traditional DBB project completed for the Texas State Guard (a component of the TXARNG). However, while the project for the Texas State Guard had obtained their appropriate State Antiquities Landmark permit and Section 106 concurrence from the THC via a standard DBB process, at the time that the CFMO scheduled troop labor, there had been no design or "Type A" services completed. In an informal manner, the project was following a DB process.

This created a challenging situation for the TXARNG CRM. Without a full set of design documents or fully prepared technical specifications, it was impossible to submit for the State Antiquities Landmark permit. While the CFMO design branch was in process of preparing design, it was far from complete and there was only a very basic scope of work prepared in order to fund a request for troop labor support from an engineer unit from Fort Cavazos (formerly Fort Hood). In addition, the timeframe for which the troop labor was available was rapidly approaching and not only would it not comply with the 60 day period required under the Antiquities Code; it was not going to allow the 30 day review period for standard Section 106 reviews. While both the state and federal antiquities laws do have leniency to complete emergency projects on an amended timeline, this project fell in a grey area as it was not related to a natural disaster or unforeseen circumstance beyond limited funding and timeline.

With these factors facing the TXARNG, the CRM reached out to the THC architectural reviewer and requested a meeting to lay out the facts and explain the situation to determine if there was a creative way to move forward with proper coordination but not delay project site work from beginning. CFMO design team prepared their 35% design documents and draft specs to accompany the aforementioned SOW related to the troop labor and the team sat down with the THC to go over the project. As a result, the THC agreed to allow the interior demo of non-historic materials to proceed but asked for the completed design and specifications to be submitted at later date for the permit to be issued.

4.2.4 Changes in funding and scope during Design-Build

The troop labor project initiated the demolition phase in spring 2018 as the CFMO worked to complete the design documents and specifications in order to contract the formal rehabilitation work with a GC once additional funding was obtained. This included the exterior rehabilitation work, which included removing the historic sliding metal doors, building a wall within the structure, and then replacing the doors in a mounted open position. A similar approach had been taken with Building 37 in rehabilitating the space for office use and creatively retaining the metal doors, a significant feature of the building's history (Figure 28).

Figure 28. Photo showing the original warehouse row with the corrugated metal doors visible and prior to later alterations such as expanded parking in front of buildings and awnings added to some windows, undated but estimated to be between 1943 and 1950s (Texas Military Department).

However, as funding constraints and timing for project completion started to present challenges, TXARNG decided to adjust the scope of the troop labor to include additional duties beyond the original demo tasks. The engineer unit from Fort Cavazos (formerly Fort Hood) was soon set to work cutting out foundation slab, removing the historic metal doors and working to frame and drywall the new interior office space (Figure 29). Throughout most of 2018, the unit worked on the building.

Figure 29. Soldiers from Fort Cavazos (formerly Fort Hood) work to cut foundation after removing all non-historic building interior finishes from warehouse. View to the

west in the approximate vicinity of the former "left" pictured in Figure 24, 2018 (Texas Military Department).

In this quick response scenario, the benefits were expected to be adherence to the initial proposed times schedule and a savings in costs for extending the work period of the unit. It was also considered a training benefit for the soldiers doing the work, as it gave them more technical experience working on vertical construction and a unique perspective in dealing with a historic structure. However, as often happens, lessons learned were quick to accrue.

An initial issue arose with the deployment of the original project manager. While another CFMO project manager was assigned the project, the new manager was not made aware of the issues surrounding the initial issuance of the historic permit without full 100% design and specifications. Therefore, communication was lost briefly between the CRM and the Project Manager on the issues that soon arose with the troop labor handling the expanded construction scope.

The first problem that arose in this fast-paced construction was related to plumbing. The below grade sanitary plumbing had numerous leaks due to be being installed below grade. As a result, the money that had been initially saved by using troop labor was effectively zeroed out by the error in the concrete work. In this situation, the design work was not keeping pace with the fast-moving labor for the project and the plumbing was installed too quickly without quality control and quickly covered with cement for

foundation (Figure 30). When subsequent testing was conducted, it became necessary to remove large portions of foundation to replace plumbing. This set back the gains made from using self-help labor as it required technical work and further demo of newly placed features.

Figure 30. Excavation of new foundation to reveal leaking plumbing lines, 2018 (Texas Military Department).

A second problem was encountered as the interior finishes approached completion. An often-overlooked issue in transitioning uses of buildings is the layout and design for communications and networking. In the case of Building 38, the former warehouse was going to become an administrative space for workers. This included enclosed offices along the northern and western elevations, but also a large number of planned cubicles in open areas throughout building. With the fast pace of the DB, there was an omission in design to provide communications and electric drops either in the floor or through ceiling trays to serve the planned cubicle and workspaces. The original 65% design had shown placement of new power poles to allow cable drops down to each cubicle space. However, as the project moved forward, this portion of project was overlooked in midst of other issues.

Timeline for occupation of building was delayed as the project once again had to be redesigned and retrofitted for communications drops (Figure 31 and Figure 32).

Figure 31. Cable trays for Building 38 were in original design but the connecting posts to bring cables to cubicle drops had to be added when floor outlets were not included in finishing of floors, 2019 (Texas Military Department).

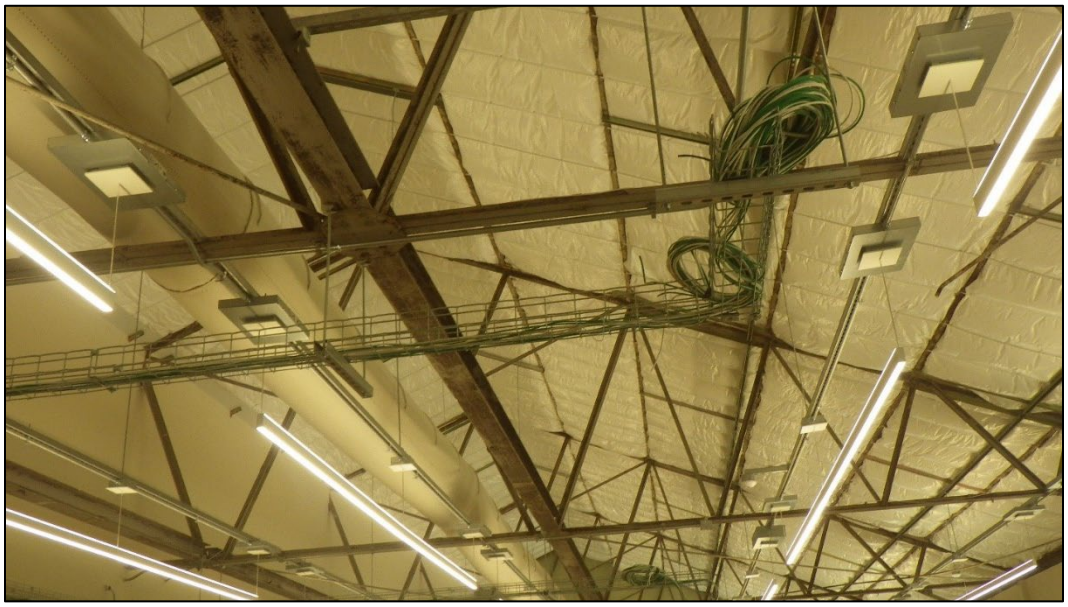


Figure 32. A photo of Building 37, with the finished office space shown and the original historic metal doors mounted back in an "open" position to retain integrity while adaptively reusing the space [Note the absence of floor outlets or posts to provide electrical and communications drop in open space for cubicles.], 2019 (Texas Military Department).

4.2.5 Analysis and Lessons Learned in Design-Build

After a recent effort where soldier self-labor was used to prepare a building for rehabilitation in a successful cost savings measure, the Building 37

project looked to save dollars and time by employing the combination of in-house design by CFMO architects and access engineering units at nearby Army installations to utilize the early stages of demolition for a training exercise. As can be seen in the summary, while the project overall has resulted in a thoughtful adaptive reuse of a large warehouse, some of the challenges presented in this DB created significant timeline delays for occupation and a reduction in cost savings due to errors requiring removal and reinstallation of some materials. However, most of these problems could be alleviated through a more careful approach to using a DB approach in combination with other unique approaches such as phasing a project with different levels of labor.

Ultimately, the project completion did provide much needed updated and modern space for Texas Military Department employees while keeping the Camp Mabry Historic District visual appearance intact. Despite the setbacks that increased cost, overall, the project still did not cost as much as new construction of the same square footage or running a full rehabilitation contract out to bid.

As can be seen in Figure 33 - Figure 35, the exterior building has retained significant features of the original building (windows, corrugated metal doors and limestone mortar) and minimized modern impacts by unique design solutions such as keeping historic metal doors in a mounted “open” position. ATFP measures were addressed creatively by designating the eastern side of the building, which runs along a busy state highway as storage space to allow for the building to be reused while maintaining appropriate stand-off distances from the road.

Figure 33. South elevation of Building 38 showing the new wall and windows along with doors in mounted open position to retain historic character. Also note that the far end of building is along a busy highway, so this end of building was designated storage to allow it to safely provide office space to employees in compliance with ATFP standards, 2019 (Texas Military Department).

Figure 34. West elevation of building showing the rehabilitated original windows and doors in place. [Note these doors no longer are functional but were left in place to avoid adverse effect to exterior.], 2019 (Texas Military Department).

Figure 35. North elevation of Building 38 showing new main entrance for employees in middle of picture. [Note it faces the main entrance of Building 37 for symmetry in visual appearance.], 2019 (Texas Military Department).

The main issues in this DB process were tied to controlling the design documents as the construction process proceeded. With the early initiation of project with troop labor using early design at 35-65%, it was important to keep track of important elements, particularly the plumbing, mechanical, electrical and communications elements. The original troop labor was planned for the demolition phase only and when they were tasked with additional scope of duties, it created disconnects between the design development and execution on the ground. Ultimately, there were no negative impacts to the historical fabric of the building, but the time delay in the renovation has the unintended impact of creating a potentially negative mindset about historic renovations.

Critical to the ultimate success of this project, despite its obstacles, is the close coordination between the SHPO and the CRM and CFMO staff. The CRM works very closely with the CFMO subject matter experts in construction project management, architects, and leadership to develop strategies to work with the SHPO for successful outcomes. It does not benefit a CRM at an installation to simply wait until project managers present them a design that they know might be problematic for a regulatory reviewer, whether a SHPO or a tribal historic preservation officer (THPO). Many potential regulatory pitfalls can be overcome by proactively meeting with the SHPO to reach a solution together that allows for projects to continue to move forward even if there are some details to address. This is, of course,

totally dependent on the particular type of project and what it potentially is impacting. A buried archaeological site obviously cannot be removed in course of working out details, however, many building or structure projects can still move forward while working out the appropriate regulatory compliance.

4.2.6 Troop Labor: Benefits and Best Practices

Department of Army is unique in having soldier units who train as engineers, both vertical and horizontal capabilities. Connecting with units to actively engage them in assisting with projects where they can gain experience while providing the appropriate quality work required for a particular structure or project may be challenging but as several projects at Camp Mabry have shown, they can be rewarding even if there are setbacks encountered. It is a general rule of thumb that any building or structure rehabilitation, whether historically significant or not, yields unexpected discoveries and errors in execution despite the best plans and project management.

It is recommended that installations explore the options for troop labor, especially in the role of minor construction work and demolition activities. A best practice would be to assign an experienced project manager and/or construction supervisor to oversee and direct the troop labor to provide guidance and experienced advice on site. Providing in briefs to troop labor on safety, environmental and reviewing design plans carefully also provides quality control, particularly if units are working on building and not just demolition.

It is also wise to work with a full 100% design and scope of work with appropriate technical specifications. In other situations, more experienced professionals can work with less to accomplish goals of project in close collaboration with design team. However, with troop labor with varying degrees of experience and ability across the soldiers, it may be more difficult to manage to maintain control and communications on an active job site.

An example of this situation from Building 38 is the inadvertent discovery of an open hole in exterior wall when troops were demolishing interior non-historic elements. The southern wall had an exterior hole that had been made in the past to allow for mechanical supply from old HVAC or other equipment. When it was removed, it was simply covered with plywood. The troop labor removed the plywood and saw the exposed hole.

They then proceeded to begin with a patch, finding historic limestone block that are stockpiled at Camp Mabry and mixing modern concrete to "patch" opening. A CFMO architect saw the work about to begin and informed the CRM, who then stopped work to prevent the incorrect application of modern concrete to the historic limestone wall. Because of the unique nature of Camp Mabry, CFMO maintenance personnel had undergone training in mortar repair and repointing in previous years. These personnel had a mix of appropriate mortar to patch and repair limestone buildings and they were brought over to provide their expertise and input on repairing and replacing the stones.

While this example was corrected thanks to the belated oversight of an experienced design manager, it is important to note how some simple adjustments to the implementation of the project would have improved the flow of the project. Communication always remains key and when a project faces challenges of budget limitations, timelines, and unique construction processes, it is always important to engage all the relevant personnel to meet regularly and often to keep project on track and with lower chance of mistakes and errors in execution.

4.3 Archaeology and New Construction

In considering the role of historic coordination with construction projects, most people will automatically think of buildings, with images of historic frame homes, stately brick buildings, and other large above ground structures coming to mind. While it is true that most construction projects requiring intensive historic preservation expertise in design and regulatory coordination are those involving rehabilitations of historic buildings or structures, there are still issues that can arise in construction planning and processes when dealing with potential or known buried archaeological sites. For the military services, these issues are most commonly encountered when dealing with construction of ranges, or anything involving large-scale disturbance of ground.

DoD service branches all have requirements for installations to have some form of an ICRMP, that is used to minimize the chance of conflicts in mission training and support activities. In a perfectly integrated program, the cultural resources program coordinates with the installation designated planning and programming offices to ensure all regulatory compliance issues are identified and coordinated in advance of projects beginning. The ICRMP would ideally be planning and prioritizing their archaeological

inventories and evaluations for NRHP significance based on the annual and/or long-range work plans or master plans. In this manner, sites are identified and dealt with, whether through being found ineligible for the NRHP and further protection or through mitigations such as data recovery excavations conducted in advance of projects if avoidance is not a reasonable option.

However, the complexity of funding, rapid changes in military needs and requirements often mean that it becomes difficult to perfectly balance the regulatory preservation requirements with project execution. In the following archaeological examples, it can be seen that the general construction process, regardless of DB or DBB can create challenges for situations involving archaeological sites. An example from Fort Cavazos (formerly Fort Hood) shows how coordination and communication can adversely impact projects vetted through proper environmental reviews. In contrast, thoughtful master planning can ensure improved coordination and preservation of resources as is shown in the example from Fort McClellan in Alabama.

The Fort McClellan Army National Guard Training Center case study was prepared by Dr. Heather Puckett, the CRM for the Alabama Army National Guard. The Fort Drum Airfield Barracks study was prepared by Fort Drum CRM Dr. Laurie Rush and Cultural Resource staff Margaret Schulz and Jaime Marhevsky.

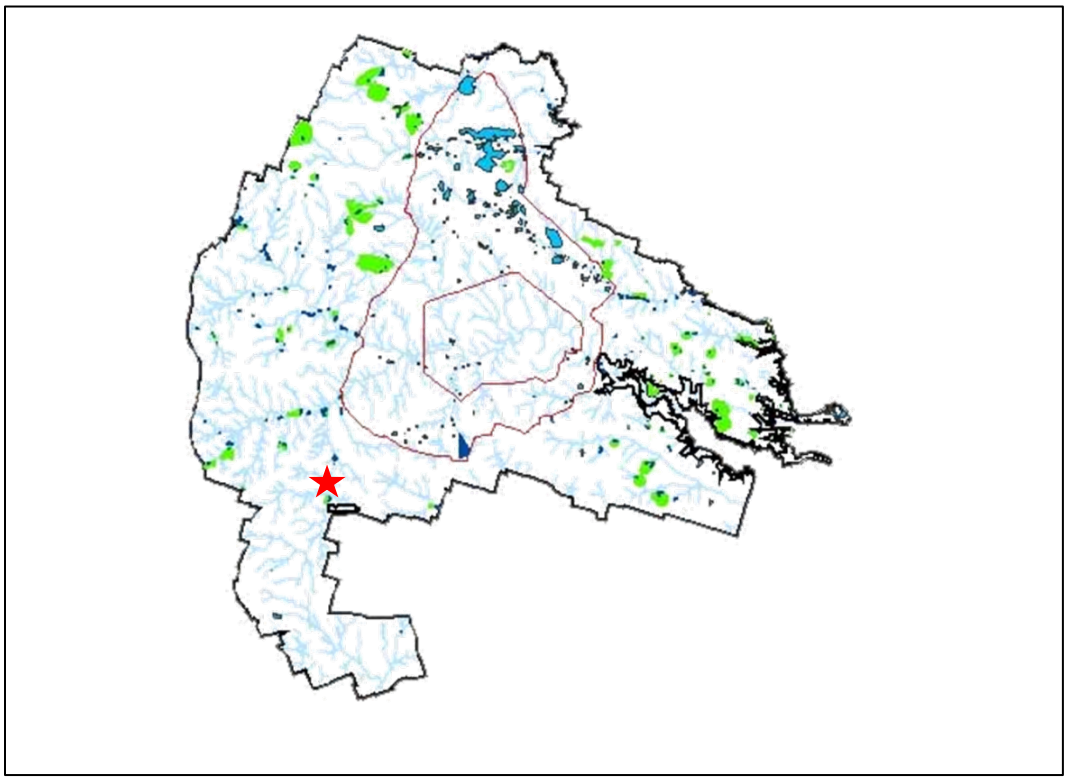
4.3.1 Clear Creek Golf Course, Fort Cavazos (formerly Fort Hood), TX

Fort Cavazos (formerly Fort Hood) is an active-duty army installation, located in central Texas (Figure 36).[110] At 264,000 acres, it is one of the largest army training bases and spans two counties, Coryell and Bell. Established in 1942 to prepare soldiers for World War II deployment, it is a large installation with over 40,000 soldiers, family members and civilians and contractors working within its cantonment and training areas. As with many large installations, Fort Cavazos has many different recreational facilities to support the active-duty soldier population, including the Clear Creek Golf Course. In late 1999, an expansion project for the course

[110] On May 9, 2023, the former Fort Hood was officially redesignated Fort Cavazos. Since this section discusses work in the past, Fort Hood will still be used where applicable.

caused damage to a site. The role the construction delivery process played in the damage is examined here to identify the lessons learned.

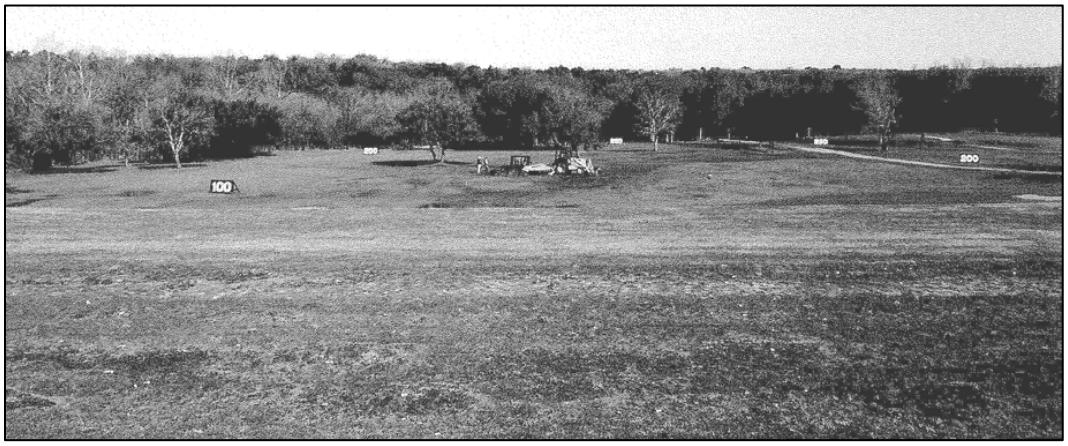
Figure 36. Map of Fort Cavazos (formerly Fort Hood) showing approximate location of Clear Creek Golf Course (red star), 2005 (Fort Cavazos).



4.3.1.1 History of Work

In 1976, the Clear Creek Golf Course was built at the west side of the cantonment with a clubhouse, driving range and courses. At that time, there was no active cultural resource program on the installation. However, in the early 1980s, the then new Fort Hood Archaeology Resource Management Program was established and conducted initial survey, noting burned rock and stone tools eroding from alluvial terrace deposits in existing golf course. Therefore, in 1987, the program conducted a baseline survey and identified five different archaeological sites along the courses. Ironically while the golf course construction in 1976 had damaged some portions of the different archaeological sites, its existence actually afforded these same sites some protection from further development as then Fort Hood's cantonment continued to expand to accommodate more neighborhoods and infrastructure throughout the 1980s and 1990s (Figure 37).

Figure 37. Clear Creek Golf Course driving range at Fort Cavazos (formerly Fort Hood), TX (From Quigg et al. 2011:4, Figure 2)



In 1998, plans were developed to renovate the Clear Creek golf course. This triggered an EA document, as required under NEPA policy, was prepared by a contractor given the size of the project and scope of activities.

The proposed course renovations included more than 1.5 miles of golf cart path, a new maintenance building, and other grounds infrastructure (irrigation system, transmission lines, bridges etc.). Unfortunately, as often happens in the NEPA process, the details of the final golf course design were not completed at the time of the EA development and therefore, the document lacked sufficient details on the amounts and scope of ground disturbance to place sprinklers, clear vegetation, install golf cart paths through area.

In an effort to address mitigations within the EA, the document specified that construction activity could be limited to the surface (top 20 cm) of the cultural resource sites, there would not be any damage to the cultural resources and no need for further archaeological investigations. An archaeological monitor was recommended to avoid the ground surface disturbance activities occurring on or near these (five) specific sites. The EA also noted that three prehistoric sites (41CV413, 41CV1445, and 41CV1446) were buried in alluvial terrace deposits at various depths beneath the present golf course surface. It clearly stated that digging trenches, blading off high areas, construction of small bridges for golf cart paths across small drainages, and the creation of water holding ponds at or near any of these specific locations may cause negative impacts requiring mitigation.

The then Fort Hood archaeology department worked closely with the TX SHPO to reach a 106 approval with conditions that non-mechanical mulching be conducted in the vicinity of the archaeological sites and archaeological monitors be present when such work was being conducted. The archaeologists took steps to mark the off limits to vehicles areas with wooden lathe and flagging. Pre-construction briefings took place where the archaeologists informed all contractors working on the project to stay out of the marked areas with vehicles and to not conduct any mechanical vegetation removal.

During a preconstruction meeting, all contractors were advised to stay outside the boundaries of the restricted area. Unfortunately, mechanical clearing of some trees on site and behind the buffer zone line disturbed parts of site 41CV413 in violation of the ARPA of 1979 and the SHPO-agreed upon avoidance measure. This damage resulted in an Army Regulation 15.6 investigation by Fort Hood's command.

When archaeologists noted the disturbance, a stop work order was issued for the area. Fort Hood archaeologists conducted a damage assessment study.[111] Field examination of damage extent compared to the aerial photograph concluded that the bulldozer removed some 25 to 30 trees mostly in one cluster within an area measuring 6,439 m sq. This constituted damage to about nine percent of the original site size and was focused on the portion of site containing a burned rock mound. It was found that most of the disturbance had been from a bulldozer tread, which damaged the site to a depth ranging from 10-20 cm.[112]

Because the site had not undergone NRHP testing, the Fort Hood archaeologists followed their Standard Operating Procedures of their ICRMP which recommended formal testing take place on the damaged site as a first step in the investigative process. If the site was found to Not Eligible to the NRHP after a thorough testing involving 10-14 backhoe trenches along with 6-8 1 m x 1 m hand dug pits, the site would be considered non-historic and not requiring management although the unauthorized digging itself would still require investigation. However, if the site was indeed

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[111] Karl Kleinbach, *ARPA Damage Assessment Report for 41CV413*. Fort Hood, Texas: Directorate of Public Works, Environmental Division, 1999).

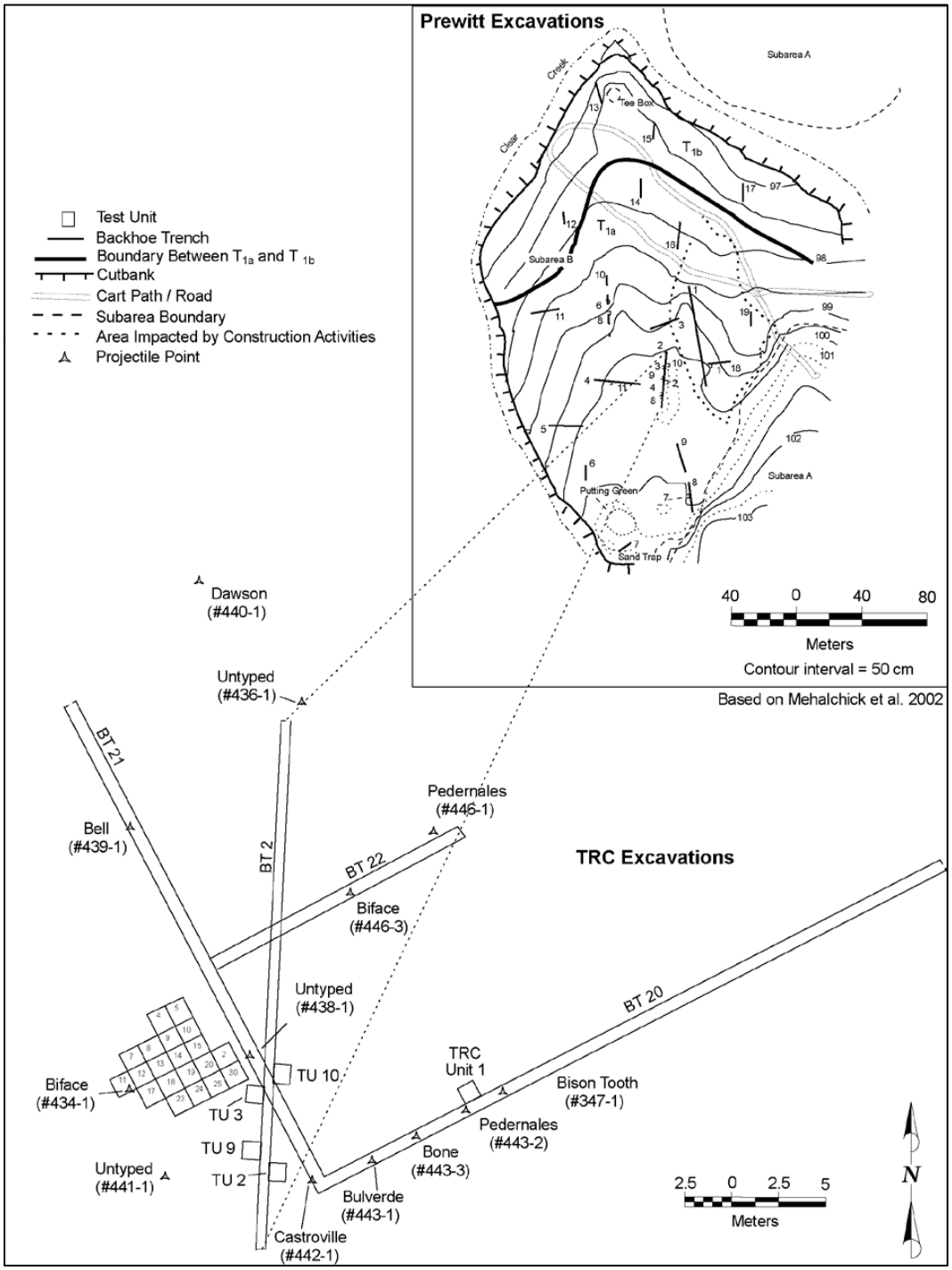
[112] Ibid.

found to be Eligible to the NRHP, a plan for mitigation would need to be developed and implemented under the Section 106 regulatory guidance.

In 1999, Fort Hood contracted with Prewitt and Associates to undertake the formal site testing project (Figure 38). The trenching allowed them to identify two sub areas of the site, A & B and see where intact sediments were most likely located given the large amount of fill across the site.[113] While some trenches and units were placed in area of disturbance, a larger number were placed in the undisturbed area of site to assess properly the condition of buried cultural materials prior to the disturbance by the dozer.

[113] Gemma Mehalchick et al., *Geoarchaeological Investigations at the Clear Creek Golf Course Site (41CV413), Fort Hood, Texas*, (Fort Hood, TX: United States Army Fort Hood Archaeological Research Management Series, Report No. 46, 2002).

Figure 38. Site 41CV413 mitigation units in larger area and the NRHP testing effort shown in inset (from Quigg et al., 2011:6, Figure 3).



As they proceeded with their work, Prewitt and Associates focused the majority of the archeological testing on a burned rock midden complex (either one large midden or two to three separate smaller middens) in the central portion of Subarea B, but some testing of non-midden deposits also was

completed. Other features encountered are internal hearths or earth ovens and nonmidden hearths and activity areas. Most signification was the identification of a human burial partially disturbed by the backhoe, but the rest of the burial was not excavated in accordance with the Fort Hood ICRMP procedures to leave burials in place per consultation with the Tonkawa Tribe.[114] A total of over 4,000 artifacts were recovered and 11 cultural features (including burial) were identified in the excavations and the site was recommended Eligible for the NRHP on basis of burial and other cultural occupation features.

In addition to the eligibility recommendation, Prewitt and Associates recommended a Data Recovery plan to investigate the midden and non-midden areas of the site was intended to be a data recovery phase of work required due to the damage from the site. The construction company's legal counsel objected to the proposed plan, stating that it went beyond the limits of the mechanical disturbance of the dozer and below the depth of disturbance.[115] Negotiations took place involving Fort Hood's legal office, the DPW for Fort Hood, the Texas SHPO and the construction company and their legal counsel. The company hired cultural resource firms to develop alternate plans for data recovery and eventually, after work stopped for a lengthy period due to these negotiations and implementation, the firm of TRC Environmental proceeded with their mitigation work, beginning in 2001. Upon completion of the fieldwork in 2002, the golf course project was able to proceed with completing their project. To date, the site remains buried on the Clear Creek course with no signage or information revealing the location in order to protect the burial. Fort Hood has a Dig Permit system which requires any tenants or users on the installation to complete an environmental review form before any level of ground disturbance and the site is monitored by the Cultural Resources Staff at Fort Hood.

4.3.1.2 Analysis and Lessons Learned

For many projects occurring in developed areas, there is often an assumption that there are no intact buried sites present. As a result, it often results in the focus for preservation regulatory review to focus on the above ground resources (buildings and structures) versus worrying about the

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[114] Mehalchick et al., *Geoarchaeological Investigations at the Clear Creek Golf Course Site*, 18.

[115] Quigg et al. *Cultural Resource Investigations,* 9.

potential for sub surface cultural materials or even landscape features that may be impacted with an undertaking. As this example illustrates, even in a project where cultural resource subject matter experts were involved early on in the project undertaking (from the initial NEPA document development to implementation of measures to avoid impacts), there were still significant impacts that were not only costly and timely for the construction process, but also for the damage and destruction of the historical and cultural material for the region. These are lessons learned to bear in mind when addressing subsurface cultural materials in construction projects, regardless of DB or DBB construction method.

4.3.1.3 Details in NEPA and Section 106

The process that triggers an EA or any other level of NEPA review is one that needs to include more detail and options. Under NEPA rules, it is directed to review various options and assess for environmental impacts with the notion being that the undertaking with the minimal impacts under NEPA will be selected. However, many agencies will move forward with one option and one alternative: no action. This is problematic as it is not capturing whatever other decision processes led to a proposed project in the first place, the NEPA technically should happen at that phase. It is sometimes cannot be avoided as a project location may only allow for one reasonable option to be considered. However, it is important to note that the earlier cultural resource subject matter experts can be notified when a project is developing, the more options that become available to ensure a smooth project course. Sometimes that may mean considering an alternative route or option when available, or it may simply allow the additional regulatory coordination to begin sooner, such as in a situation where there are likely adverse impacts to occur. In the situation of this case study, it may have been beneficial to allow time for the NRHP site testing to proceed prior to beginning the golf course renovation in order to assess protection levels and determine if pre-emptive mitigation should be initiated given the proximity of sensitive areas to the project.

While the NEPA process did not have full design plans of the course locations, sprinkler systems, etc., there was clearly time between the project's completion of the EA review until the beginning of the construction to provide detailed and full designs to form the basis of the coordination and meetings with the Texas SHPO to reach a satisfactory agreement for the project to proceed as a no adverse effect. This should always be a Best Management Practice to fully engage not just the SHPO but Federally

Recognized Tribes on a project with a large level of ground disturbance, even if it is proposed or described as being to relatively shallow depths below surface.

4.3.1.4 Historic Aerials, Maps, and Ground Truthing

A large amount of investigative and archival work went into the early archaeological inventories of the region and the specific study of the APE encompassed by the golf course project. Study of historic aerial maps available for the region formed the basis for an assumption that the upper 20-30 cm of had been heavily utilized by prior communities and the early military use of the land from World War II on to construction of golf course. In addition, geoarchaeological studies of creeks and landforms suggested a large amount of the surface was "overburden," meaning it lacked potential for intact cultural material. In fact, the archaeology crews themselves often employed backhoe trenches to study deposits in cross section and then mechanically stripped upper levels of modern and "disturbed" sediments.

However, as was clearly shown in the subsequent investigations, there was a large amount of useful cultural material at the shallow depths, including a human burial. While the construction specifications and documents said that there would be no disturbance beyond 20 cm below the surface, clearly the contractors and excavation work that took place went significantly beyond that level. There were arguments presented that tree roots occurring naturally had caused more damage than the construction activity, however, many times the unseen effects of vehicles moving around in forested areas and creating more erosion can have secondary effects on the trees, leading to tree root upheaval and further disturbance.

It is recommended that planned projects should be studied carefully by the responsible environmental reviewers and qualified cultural resource management staff on an installation (if available as many installations do not have full time personnel in these positions). Not only should historic maps and aerials serve as a basis for determining impact, but when reasonable, archaeologists should verify via shovel testing or other means of ground truthing (monitoring initial grading and removal of materials from previously covered areas). If a building was put in place in the 1940s, it is not going to be clear what exactly is under the foundation or piers, especially if the plans and details on the original construction are not available which often happens. It is beneficial to use multiple lines of archival evidence

and on-site verification via monitoring or pretesting to ensure there are no impacts to cultural materials.

For large projects that include a lot of ancillary site work (fencing, sprinkler systems, signage, sewer connections), it is especially important to receive full project plans and details on the depth of disturbance and details of excavation openings and size. These details should be provided in the Section 106 review materials for the SHPO and the interested Federally Recognized Tribes.

4.3.1.5 Tribal Consultation in the Construction Process

In this example from the late 1990s and early 2000, there was clearly some level of tribal coordination and review. Fort Hood's Cultural Resource Management Program was one of the first to actively consult with Federally Recognized Nations and ensure they had visibility on issues surrounding cultural sites as well as the protection of Native American burials. The installation established a repatriation cemetery at North Foot Hood to allow for reburials of Native American remains that could not be avoided at Fort Hood.

As was seen in the reports on the initial NRHP testing, the burial at the site was located in a portion of the site bladed by the dozers.[116] When archaeologists encountered the burial, they followed the ICRMP procedures for stopping all excavation and notifying the Fort Hood CRM. He notified the Tonkawa Tribe, the primary Federally Recognized Tribe consulting with the installation and it was agreed to conduct no further work in the area. To date, the burial remains in place in an unmarked setting.

It is therefore important for installations to ensure they have a document such as the ICRMP to outline procedures and processes for handling protocols for human burials and inadvertent remains located, even if found in a secondary deposit, such as eroding from creek banks, mixed fills from prior historic disturbances, etc. Tribal Consultation is a requirement for all DoD branches, as described in the DoD Instruction 4710.02, Executive Order 13007 and 12898. Each service branch also has their own regulations

[116] Mehalchick et al., *Geoarchaeological Investigations at the Clear Creek Golf Course Site*.

governing consultation and these are summarized well at the DoD's Native American Affairs website: https://www.denix.osd.mil/na/policy/.

While many times, projects occurring within the cantonments, or built environments, of installations are often considered areas where tribal nations may not have interest, given the level of development and prior impacts from construction over a long period of time, the letter of the law indicates that consultation is required to ensure all potential concerns and issues are addressed with Federally Recognized Tribes. If necessary, consultation can lead to appropriate agreement documents and/or protocols to identify the levels of regulatory coordination required for particular areas.

4.3.1.6 Avoidance and Monitoring

Avoidance of the archaeological sites was intended but did not occur, because the contractors failed to notify the CRM office of the activity at the site so it could be monitored on site to ensure understanding of the off-limits areas. It is therefore critical to establish protocol and processes via the ICRMP and other installation directives to emphasize the proper implementation of methods, whether it be avoidance with flagging/fencing/signage, monitoring procedures, or tracking activity via other methods. At the time, Fort Hood had an established installation regulation, Fort Hood 200-1, that identified a very clear and concise process for obtaining dig permits for any ground disturbance. Contractors must all obtain permits for their portion of a project when they are going to have ground disturbing activities. In situations where there are large projects such as Clear Creek Golf Course, it is especially important to ensure that sub-contractors and others responsible for site work are briefed on all installation requirements for construction activities.

4.3.2 Fort McClellan Army National Guard Training Center, Main Garrison "Enclave," of the Alabama Army National Guard

A Master Plan, prepared for the Alabama National Guard's (ALARNG) Main Garrison "Enclave" (Main Enclave) of the Fort McClellan Army National Guard Training Center in 2016, included maps depicting proposed development of several wooded areas, the majority of which contain natural resources (threatened and endangered species habitat, wetlands) or cultural resources (archaeological sites or historic structures) constraints. The NHPA, ARPA, and the Alabama Antiquities Law (Title 41, Chapter 3,

Sections 1-6) offer protection for cultural resources. The ALARNG developed the Master Plan to avoid most natural and cultural resources constraints. Because ALARNG works only with DBB with their state contracting system, this case study specifically examines the Section 106 NHPA process at Fort McClellan as it relates to the archaeological resources.

4.3.2.1 4.3.2 Fort McClellan Army National Guard Training Center Background

The military history of the Fort McClellan Army National Guard Training Center spans over a century. In August 1898, during the Spanish American War, members of the First Army Corps established Camp Shipp in Anniston, Alabama, as part of the Military Department of the Gulf. In 1912, a permanent maneuvering area, training camp, and artillery range was built in Anniston, operating under a variety of names (i.e., Camps Anniston, Pettus, Morgan, and Artillery Range). By May 1917, the War Department constructed the Camp McClellan WWI training camp to train members of the 29th Infantry Division, comprised of National Guard units from Virginia, New Jersey, Washington D.C., Maryland, and Delaware. After the War, Camp McClellan operated as a demobilization center and a storage and salvage depot for the Southeastern Department. In the early 1920s, Camp McClellan operated as the Fourth Corps Training Area, the Reserve Officer Training Corps, Corps of Engineers, and Citizens Military Training Camps.[117] In 1929, the War Department Order retained the camp as a permanent installation, renaming it as Fort McClellan.

Between 1929 and the end of World War II, Fort McClellan served as home to the 27th Infantry Division (from New York), the Branch Immaterial Replacement Training Center, the Infantry Replacement Training Center, Recruit Training Center, and the African American segregated 92nd Infantry Division.[118] Following World War II, Fort McClellan served as the first permanent homes the Women's Army Corps Center and School (1951-1978), the Chemical Corps School/US Army Chemical Center and School (1951-1999), and the Military Police School (1975-1999) (Figure 39). The

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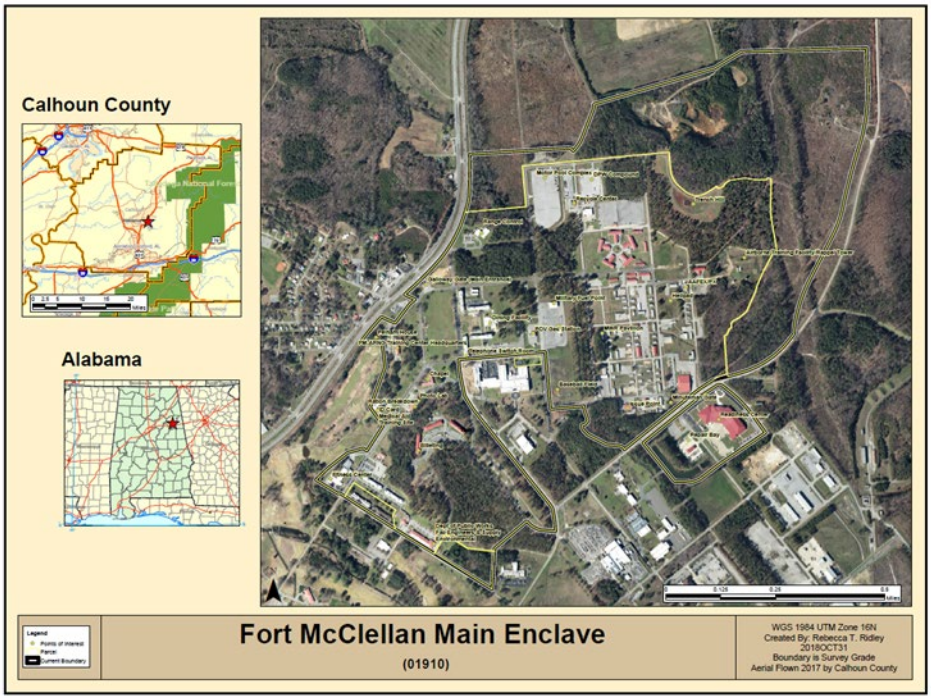
[117] USACE, *US Department of Defense Base Realignment and Closure, Ordnance, Ammunition & Explosives Chemical Warfare Materials, Archives Search Report Findings (Revision 1), Fort McClellan Anniston, Alabama*, Final. (St. Louis, MO, 2001), 5-4.

[118] New South Associates, *Fort McClellan: A Cultural Resources Overview*, 1992; *"The Military Showplace of the South,"* 1993.

ALARNG also has operated the Alabama Military Academy on the Fort McClellan property from 1961 to the present; from 1957 to 1961, the Alabama Military Academy operated out of Montgomery, Alabama (Maxwell AFB and Gunter Annex).[119]

The 1995 Base Closure and Realignment Commission (BRAC) approved the formal closure of Fort McClellan (approximately 45,679 acres). The DoD held an official closure ceremony in May 1999 and subsequently transferred portions of the property to the Alabama National Guard (via the US Army Corps of Engineers), the Center for Domestic Preparedness (Homeland Security), and the Joint Powers Authority (now McClellan Development Authority). Today, the ALARNG operates Fort McClellan Army National Guard Training Center as its primary training area. It comprises the Main Enclave (approximately 300 acres) and Pelham Range (22,245 acres) in Calhoun County, AL.

Figure 39. Location of Fort McClellan Army National Guard Training Center, Main Enclave, Calhoun County, AL (ALARNG GIS).



[119] Barnes, Alton R., Colonel (Retired). *The History of the Alabama Military Academy: It Shall Be Done*. The AMA Alumni Association, 2011.

4.3.2.2 History of Work

In 2014, the ALARNG CFMO engaged JMR+H Architects to update and modify the Real Property Master Plan for the Fort McClellan Army National Guard Training Center. In 2008, Gallup & Associates of Marietta, Georgia, published the Real Property Development Plan for the ALARNG. The Adjutant General and CFMO of ALARNG provided directives to create an updated plan "for orderly management and development of real property assets using 'bite sized' improvements which could be funded annually through available funding resources and associated constrained/limited budgets."[120] One of the goals for the Real Property Master Plan included outstanding environmental stewardship, incorporating long-range analysis, environmental analysis, as well as land use, utility, transportation, and encroachment assessments. JMR+H Architects finalized the Master Plan in January 2016.

In terms of cultural resources, there have been nearly 45 years of cultural resources investigations at Fort McClellan. In 1976, 1977, and 1982, archaeological surveys included a predictive model, a baseline for resources, and subsequent validity tests for portions of the Main Enclave, and in the 1990s, additional archaeological and architectural fieldwork in anticipation of BRAC.[121] After BRAC, at the ALARNG, there was no formal cultural resources program until 2005.

After 2005, the ALARNG began bringing the previous cultural surveys up to modern SHPO standards, and by 2017, all of Pelham Range (except the two explosives impact areas), and all of the Main Enclave had been surveyed for archaeological resources; building and structure inventories were completed between 1993 and the present.[122] At the same time, the ALARNG CRM and Geographic Information System (GIS) programs developed a geodatabase for better management of resources and associated data (i.e., site locations and descriptions, building evaluations, reports, correspondence, and eligibility status). By integrating the GIS with the

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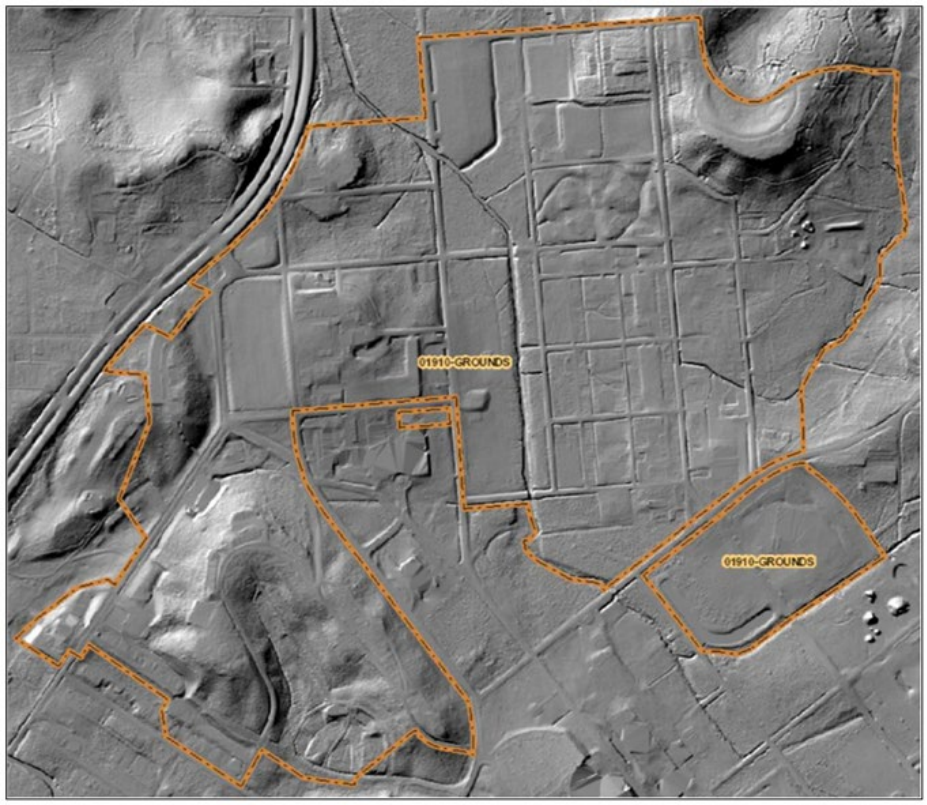
[120] JMR+H Architects, *Real Property Master Plan for Fort McClellan*, 2016.

[121] McEachern and Boice, *Archaeological Reconnaissance of Fort McClellan, AL, 1976;* McEachern et al., *Statistical Evaluation and Predictive Study of the Cultural Resources at Fort McClellan, AL,* 1980; and Holstein and Little, *The Validity Test of the 1980 McEachern Archaeological Predictive Model of Fort McClellan, AL,* 1982).

[122] New South Associates, *Fort McClellan: A Cultural Resources Overview*, 1992; *"The Military Showplace of the South,"* 1993.

cultural resources data, the ALARNG has the ability to examine historical maps, aerials, Light Detection and Ranging (LiDAR) and hillshade data (Figure 40), and other materials, during the master planning process.

Figure 40. Hillshade Model of Main Enclave, Derived from LiDAR (Courtesy of ALARNG GIS).



Since BRAC, ALARNG has trained and used the existing underdeveloped and nonconventional facilities at Fort McClellan with a targeted process of modernization, despite constrained funds and expenditure limitations. As a result, in 2014, ALARNG Adjutant General and CFMO sought means to redevelop the Main Enclave so that it may possess the facilities and infrastructure to support ongoing training missions required by this Maneuver Training Center-Light (MTC-L Level III). This included the preparation of a master plan, the demolition of structures, and new construction, all of which triggered an EA document (Record of Environmental Consideration), in accordance with NEPA, to identify both the short-range and long-range environmental impacts.

The undertaking also triggered the Section 106 process in accordance with NHPA (36 CFR 800.3-7). In this process, the agency (i.e., ALARNG) determines if the undertaking has the potential to affect historic properties, the

APE for the undertaking, and identifies consulting parties (i.e., SHPO, Federally-recognized Native American Tribes [Tribes]). If so, the ALARNG makes a reasonable and good faith effort to identify historic properties within the APE, evaluates those resources for the NRHP, and consults as warranted. The ALARNG then assesses the adverse effects to any historic properties within the (through consultation) and works to resolve those adverse effects; often this includes the development of alternatives or modifications to avoid, minimize, or mitigate the adverse effects. All of these steps are necessary prior to the project being performed. Copies of the consultation correspondence are attached to the REC to document the cultural resource coordination.

4.3.2.3 Incorporating NHPA into Master Planning

Overall, this project examined the coordination process of Sections 106 and 110 of the NHPA and impacts of the construction processes (DB and DBB) on cultural resources management. Within the planning process of a construction project (regardless of DB and DBB), the ALARNG CRM determines whether or not a cultural resources project has been, or must be, performed; if resources may be avoided; the potential for data recovery; or if mitigation must be performed. As noted above, for compliance under NHPA, these steps are performed prior to the construction project being initiated.

The Armory Commission, on behalf of the ALARNG, contracts with multiple architect and engineering forms to provide professional services for the eventual construction of various projects, which are derived from the Master Plan. JMR+H Architects, PC, completed the development of the last update to the FM-ARNGTC Master Plan. Among the projects JMR+H proposed as part of the Master Plan, are the following:

- Redevelopment (e.g., new construction) within the 1300 Area of the Main Enclave;
    - New DBB construction such as a Laundry, and Enlisted Barracks, Transient Training complex, which includes dining facilities, equipment maintenance building, barracks, and administrative buildings.
- Replacement, or advanced Sustainment, Repair and Modernization of buildings more than 50 years old;

- Demolition of multiple World War II era barracks (approximately 30 structures dating from 1941),
- Demolition of WAC barracks (e.g., Buildings 2223 and 2224),
- Renovation of multiple WAC buildings (e.g., Building 2290).

- Land Acquisition and Disposal;
  - Acquisition of lands to the north, east, and south of the Main Enclave (formerly part of Fort McClellan but transferred out of Federal ownership during BRAC).

- Circulation
  - Extension of existing roads and new road construction,
  - Walking trails/tracks.

Section 2.2.6 of the Master Plan addressed Cultural Resources on For McClellan.[123] The ALARNG prefers avoidance of known cultural resources. "In the event that a resource cannot be avoided as part of a specific project or operation, additional consultation, further investigations, and/or mitigation may be required. The standard minimum period for initial consultation is 30-days, per the NHPA; note that additional time may be necessary considering the scope of the project or operation, or type of resource involved".[124]

For the purposes of this Case Study, the ALARNG addresses DBB projects within the 1300 Area as the APE. Using the GIS geodatabase for comparison, the ALARNG identified that portions of the APE had been surveyed for archaeological resources between 1976 and 2015. Eleven cultural resources are present in the APE, ranging from multicomponent archaeological sites, prehistoric lithic scatters, WWI training trench complex, stone culverts, and military-related historical structures. Of these, one site is

[123] JMR+H Architects, *Real Property Master Plan for Fort McClellan*, 2016, 23.

[124] Ibid.

eligible for the NRHP, five potentially eligible, and one is undetermined eligibility.

Building inventory and evaluations documented all of the structures within the 1300 Area, the majority of which are WWII temporary structures.[125] Many of these buildings have been demolished (or renovated) in accordance with the Programmatic Memorandum of Agreement among the United States Department of Defense, the Advisory Council on Historic Preservation, and the National Conference of State Historic Preservation Officers (1986). No historic structures are present in the APE.

The GIS also allows the overlapping of historical maps with project plans for comparison to the APE (using transparency values). This aids in determining whether an undertaking has the potential to affect historic properties. Based on historical maps from WWI, it appears the military did use this area for training, but it did not contain any mapped structures. By 1937, however, historical maps depict multiple structures that also appear on the 1946 map (Figure 41). Further, the LiDAR/Hillshade data are examined as part of the reasonable and good faith effort to identify historic properties within the APE.

[125] AMEC, *Architectural Inventory and Assessment for the Fort McClellan Army National Guard Training Center,* 2002; Puckett, *Building Inventories and Evaluations, Fort McClellan Army National Guard Training Center,* 2016.

Figure 41. Example of 1300 Area Building Layer Overlaying the 1946 Master Plan Map (Courtesy of ALARNG GIS).

In portions of the APE that have not been surveyed to modern archaeological standards, the ALARNG performed cultural resources surveys to identify and perform a preliminary evaluation of any potential resources encountered. The review of the GIS provides a litmus test for ground-truthing known resources or anomalies depicted by the LiDAR/Hillshade. Any archaeological shovel tests, survey areas, or identified resources data is added to the GIS geodatabase. Based upon the findings, the ALARNG consults with the SHPO and 19 Tribes, assessing any adverse effects to historic properties within the APE.

In consultation with SHPO, the ALARNG maintains a 100-foot buffer around all properties eligible for or included on the NRHP; properties which have not been formally evaluated under the NRHP Criteria; and properties that are protected in consultation with the Tribes who have ancestral ties to lands the ALARNG manages. The ALARNG CRM uses flagging tape to mark the buffer for avoidance prior to any ground disturbance; during the undertaking, the ALARNG CRM either monitors

the activities or revisits the cultural resources after completion of the project to document its disposition. Often, this allows ALARNG to avoid any adverse effects or provides a venue for proposing mitigation for the adverse effects.

4.3.2.4 The Enlisted Barracks, Transient Training Complex APE Example

Within the Master Plan, JMR+H Architects designed the Enlisted Barracks, Transient Training complex. The design charrette took place in October 2019 and the groundbreaking ceremony held in July 2021, with a proposed occupation by April 2023. In addition to the document reviews, surveys, and consultation, the ALARNG CRM took part in the charrette and reviewed the funding document Form 1390/91 and NEPA Record of Environmental Consideration. An element of the consultation, the ALARNG CRM provided the SHPO with copies of the 35%, 65%, 95%, and 100% design development; this is performed to prevent project encroachment on known cultural resources within or adjacent to the APE.

As noted above, previous surveys recorded eleven archaeological resources within the APE but no significant architectural resources. The ALARNG previously documented historical stonework on the Main Enclave.[126] One resource falls within the APE, a stone culvert likely constructed between 1933 and 1946 as part of the WPA or Civilian Conservation Corps (CCC) efforts, or by Prisoners of War (POW). The ALARNG prepared a State-level documentation packet, similar to that required for HAER, with photographs and drawings of the feature, which contained river rock cobbles, cement, and an aluminum-ribbed culvert. During the consultation, the ALARNG recommended incorporating historical information (e.g., photographs of WPA, CCC, and POW at Fort McClellan) into the construction (or interior design) of the proposed barracks. As a result of these mitigating efforts, the SHPO concurred to a "finding of No Adverse Effect with Conditions;" but also requested that the stone recovered from multiple culverts in the APE be reused to construct a new feature within the APE.

As buildings or structures are demolished and the onset of building site preparation, the ALARNG CRM continues to monitor known cultural resources within the APE, but also continues to observe the area for

[126] Puckett et al, *Historical Stonework on the Main Enclave of the Fort McClellan Army National Guard Training Center,* 2013.

inadvertent (43 CFR 10.4) or post-review discoveries (36 CFR 800.13), following SOPs in the ICRMP. From the GIS and archival research, there is the potential for pre-military, World War I, and World War II era archaeological resources to be present within the APE, and monitoring provides an opportunity to record the disposition of these resources if discovered.

JMR+H Architect's rendering of a completed barracks building provides a glimpse of the new facilities in the APE (Figure 42). On July 29, 2021, the Fort McClellan Army National Guard Training Center held a groundbreaking ceremony, kicking off a two-and-a-half-year project, replacing 15 WWII-era buildings with three two-story barracks, two single-story barracks, two dining facilities, two company administration buildings, and a battalion headquarters building, totaling 107,812 square feet of new construction with bunk space for more than 350 personnel (Figure 43). In addition to barracks or lodging, this new development will be equipped with laundry facilities, lounges, and Wi-Fi (wireless fidelity) for off-duty hours (Figure 44).

Figure 42. Bird's Eye View, Architect's Rendering of Proposed Enlisted Barracks, Fort McClellan Army National Guard Training Center, Calhoun County, AL (Courtesy of JMR+H Architects).

Figure 43. Ground-Breaking Ceremony, June 2021 (Courtesy of ALARNG Public Affairs Office).

Figure 44. Architect's Rendering of Enlisted Barracks, Fort McClellan Army National Guard Training Center, Calhoun County, AL (Courtesy of JMR+H Architects).

4.3.2.5 Analysis and Lessons Learned

Through the course of this Case Study, the ALARNG finalized the Master Plan and initiated several of the actions addressed in it, such as the building demolitions, road improvements, and site preparation for the Transient Training Complex construction. The Armory Commission also acquired three new parcels of land (encompassing 175 acres total), which have been incorporated into the boundaries of the training center and surveyed for cultural resources.[127] Presently there is discussion on updating the Master Plan.[128]

[127] (Price, *Phase I Cultural Resources Assessment of 175 Acres at Fort McClellan Army National Guard Training Center,* 2018.

[128] Mr. Chris Smith, personal communication.

The ALARNG and Armory Commission may acquire an additional 200 acres of land (six or more parcels). These parcels have the potential to contain cultural resources, ranging from a large prehistoric village; former Reilly (air) Field; historical road networks; Rock Cottages historic district; Civilian Village; a WWII-era incinerator site; military landfills; to potential resources associated with WWI-era Camp McClellan. A revised Master Plan will consider additional development for the new parcels.

Based on the Master Plan, there are several lessons learned taken from the Case Study. While supporting the Master Plan, the initial goals for the ALARNG CRM were to meet the requirements of NHPA and ensure preservation of known significant cultural resources as much as possible, while allowing the ALARNG to proceed with its military training mission.

One aspect that worked well is the ALARNG's geodatabase, which allows CRM personnel to review the project APE in tandem with historical maps, aerials, and prior survey data. Reviews of the GIS data from multiple years of archaeological surveys identified that prior archaeological surveys did not encompass all of the Main Enclave; certain portions of the 1300 Area were inaccessible or not surveyed due to extant development (e.g., structures, parking areas, roads). The ability to use the GIS in this capacity allows us to predict the potential location of features related to past land use, which may correlate to archaeological sites.

Previous surveys failed to consider the presence of WWI and WWII-era resources or identify resources within their proper contexts. This has become a growing trend as resources reach the age threshold necessary for both NHPA consideration (i.e., 50 years) and protection under ARPA (i.e., 100 years). Add to this the biases or consensus among multiple researchers as to what constitutes an archaeological site, changing temporal classifications, or as new technology allows for advanced research methods (e.g., remote sensing, high-resolution satellite imagery, LiDAR, and the use of GIS) for recording sites. Also not considered were other potential resources, such as landscape features (e.g., Civilian Village, WWI Era Training Trenches, or the Women's Army Corps Memorial Triangle). Again, incorporating the GIS data into the CRM reviews of projects helps with our reliability for determining the presence, absence, or potential for cultural resources. The ALARNG CRM subsequently follows up with ground-truthing, site visits, or monitoring during ground-disturbing activities identified in the Master Plan and DBB projects.

Likewise, the ALARNG contracted many building evaluations for the Main Enclave; however, some of these did not consider resources under a proper historic context (e.g., Cold War versus Women in the Military). An example relates to structures constructed in association with the former Women's Army Corps Center and School, the Chemical School, or the Military Police School, which operated at Fort McClellan from the 1950s. When evaluated in the 1990s, researchers only considered these resources under the Cold War theme (NRHP Criteria Consideration G: properties achieving significance within the past 50 years).[129] Only recently have formal contexts been prepared specifically for the Women's Army Corps and Chemical Corps properties at Fort McClellan Army National Guard Training Center.[130]

As a result, participating in the Master Plan allows ALARNG ample time to plan conservation funds for subcontracted labor, perform necessary research or write comprehensive historic contexts for specific resource types, and complete cultural resources surveys to support DBB projects.

Overall, communication is vital and cannot be stressed enough, not only among ALARNG CRM and CFMO personnel, but also through the consultation process with SHPO and Tribes. As projects develop out of the Master Plan (from the DBB process), or as the Master Plan itself is revised for future planning at Fort McClellan Army National Guard Training Center, additional (or continued) consultation is necessary to comply with the NHPA. Subsequent to that are staying on top of project plans, design changes, updated project schedules, and continuing to monitor all ground disturbance related to the projects.

4.3.3 Airfield Barracks at Fort Drum, New York

Fort Drum is a power projection platform and home of the 10th Mountain Division Light Infantry, the Army's most deployed division. The mission of Fort Drum is to support a fighting force that can arrive anywhere in the world within 24 hours prepared to engage and win. Fort Drum is located

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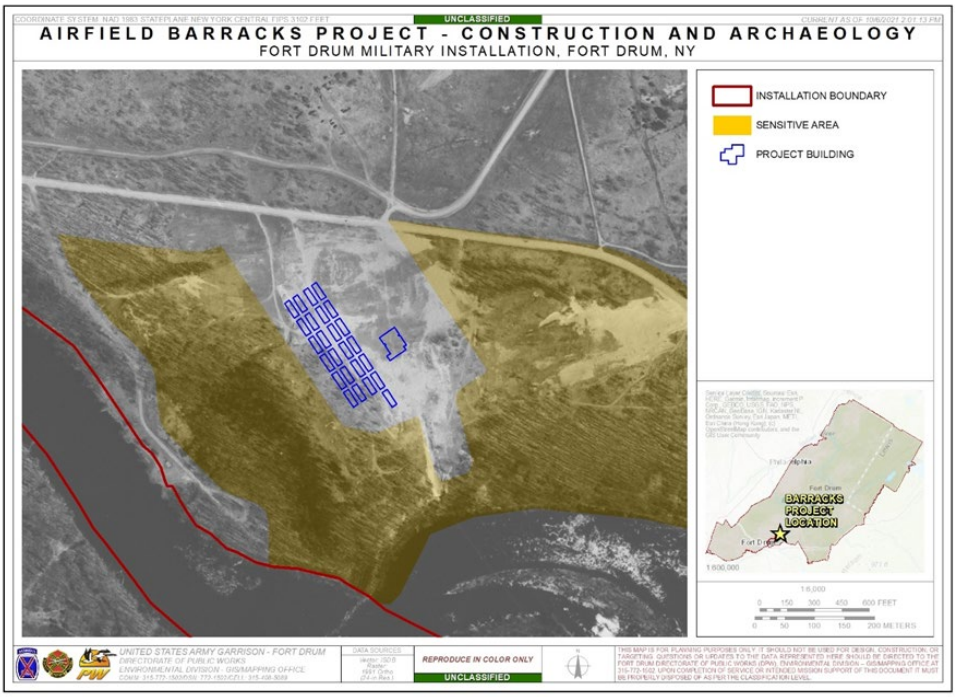
[129] New South Associates, *Fort McClellan: A Cultural Resources Overview*, 1992; *"The Military Showplace of the South,"* 1993.

[130] Puckett, *A Proposed Allied Trades Shop at the Main Enclave of the Fort McClellan Army National Guard Training Center,* 2020; Puckett, *A Building Inventory and Evaluation for the Former Women's Army Corps Center and School Properties on the Main Enclave of the Fort McClellan Army National Guard Training Center*, 2021.

just south of the Canadian Border in Northern New York, but its location on the ancient landscape informs the challenges of construction project placement and cultural resources management. Fort Drum's Wheeler-Sack Airfield is located just north of the Great Bend of the Black River, a waterway which has been a key route for indigenous people for over 13,000 years. The Fort Drum cantonment adjacent to the airfield is located at the portage which connected the Black River system that leads to the Eastern Seaboard with the Indian River system that leads to the St. Lawrence River, the Great Lakes, and the Maritimes (Figure 45). The northern sandy bluffs of the Black River where the proposed airfield barracks were to be located is highly sensitive for prehistoric archaeological sites dating back to the earliest occupation of the Americas.

Figure 45. Location of the notional barracks project on Fort Drum, limited to the footprint deemed to be least sensitive for significant archaeological deposits (Fort Drum). Also note the project area proximity to the Black River located to the south and west.



This portion of Fort Drum is also the most historic in terms of military occupation. The cavalry began training on this area of the installation in 1907, with officers' tents placed at the summit of a sand mound called the "Hogs Back," where they had an excellent view of the cavalry spread out below. The first commanding officer to bring Soldiers to train at Fort Drum was Frederick Dent Grant, son of Ulysses S. Grant. The Hogs Back is

a sand dune created during the retreat of glaciation and enhanced by thousands of years of indigenous occupation (Figure 46).

Figure 46. WWII-era postcard of the Hogs Back (Fort Drum).

4.3.3.1 History of Work

In the mid-1980s, prior to establishment of current military CRM programs, US Army Corps of Engineers (USACE) made the Hogs Back available as a source for borrowing sand for construction of modern Fort Drum without any form of archaeological review. As a result, contractors removed approximately half of the landform and a major portion of the surrounding sands and redeposited the material throughout the Fort Drum cantonment. Serious archaeological survey of this area, now called Training Area 6C, began approximately five years later when the potential significance of archaeological deposits within and surrounding the dune immediately became clear. However, as the Wheeler-Sack Army Airfield located north and adjacent to the area in question began to expand exponentially, real estate in the immediate vicinity came under increasing pressure for new construction. In 2004, Fort Drum Engineers and Master Planners came to the cultural resources program just after conclusion of the archaeological field season with a proposed footprint for new airfield barracks to be located at the base of what remained of the Hogs Back. The original construction drawing consisted of a footprint containing twenty-five modular barracks structures each measuring 70 ft x 140 ft plus a community building. The Engineers had also determined that the project

needed to be a construction priority to address concerns about housing available for the Aviation Brigade and their impending return from deployment.

Ordinarily the Fort Drum Cultural Resources team requests all construction project footprints to be submitted at least two years prior for proposed ground-breaking in order to allow, not only for archaeological survey, but also for an opportunity to complete evaluation of any finds for National Register status and/or to adjust the proposed footprint to achieve site avoidance. Clearly, receiving a project proposal after termination of the field crew for the winter with a request for early spring construction offered a significant challenge.

4.3.3.2 Cultural Resources Support for On Time Project Completion

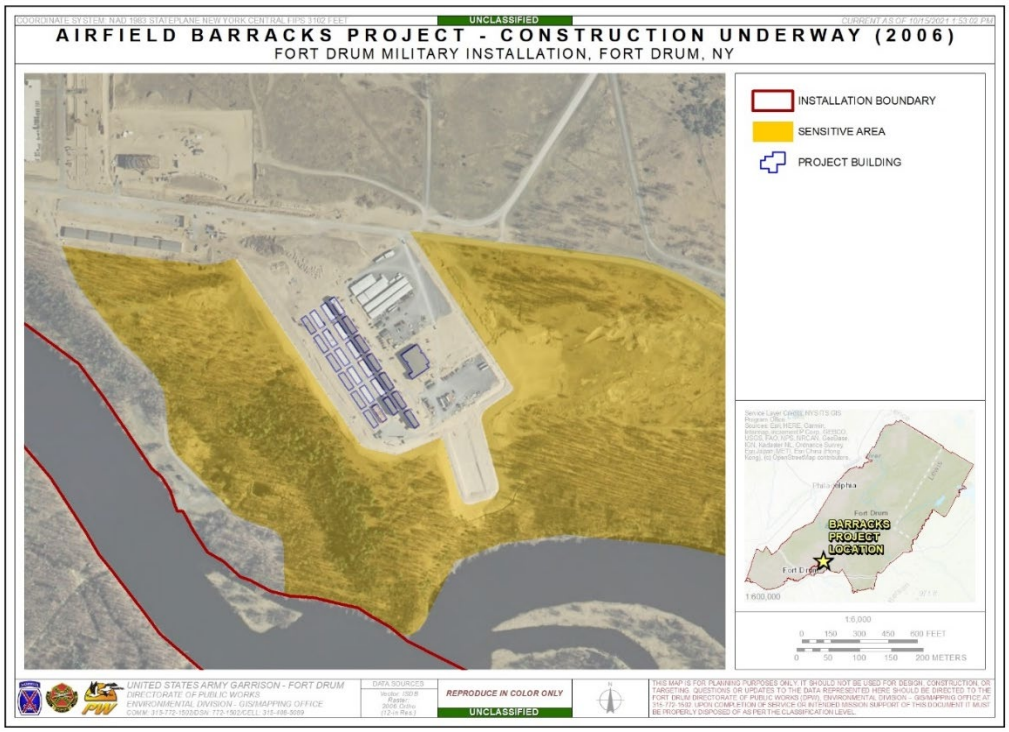
Given the challenge of weather preventing the traditional shovel testing approach for survey of the proposed project area, the cultural resources team used historical knowledge of damage in the area to begin to develop an idea of where the project might be located with minimal risk of damage to potential archaeological deposits. The team analyzed historic maps and a series of aerial images dating back to 1940 in order to estimate the boundaries of soil destruction and removal within the landform.

Once this footprint was identified, the team decided to test the proposed area using excavation with heavy equipment in order to view soil profiles in order to confirm whether soils had been removed and/or soil depositional integrity had been destroyed. A series of seven test excavations approximately 3-5 m deep and 1-2 m wide were monitored and photographed by the Fort Drum archaeology program coordinator. All the excavations were negative for any type of artifact or feature, and two of the excavations showed extreme soil disturbance (Figure 47).

Figure 47, Soil profile for Trench AB 6 showing extensive soil disturbance with no evidence of intact deposition or stratification either above or below the buried A horizon noted (Fort Drum).

The programmatic determination was that the project could move forward within the footprint designated and defined by the cultural resources program. The constraints of the defined footprint meant that the project had to be redesigned to fit the approved area. When viewing the project from the air, the most obvious adjustment was that the Engineers could no longer orient the buildings to be parallel to the road, but rather the development was rotated at an angle to fit the footprint provided (Figure 48).

Figure 48. Aerial image of the Airfield Barracks under construction with all construction impacts within the designated footprint determined to have been previously disturbed and negative for archaeological material (Fort Drum).



4.3.3.3 Details in Section 106

Under normal circumstances, when the Fort Drum archaeological survey has the luxury of multiple field seasons to consider a proposed project area, the Cultural Resources program submits its findings and recommendations to the New York SHPO and Fort Drum's three Native American Partner Nations, the Oneida Indian Nation, the Onondaga Nation, and the St. Regis Mohawk Tribe in an annual report. It is the program's goal to have the annual reports in the mail to the consulting partners no later than the spring following the previous field season. However, the optimal annual report time-table can be a challenge, so in cases where the undertaking might take place prior to issuance of the annual report, the program selects archaeological projects to "pull ahead" for consultation. The Airfield Barracks is an example of a "pull ahead" so the project report and recommendations would have been submitted to the Nations and the SHPO with a generous amount of time allowing for the required 30 days for comment and beyond. There were no comments for this project, so concurrence was assumed prior to groundbreaking.

4.3.3.4 Analysis and Lessons Learned at Fort Drum

The most important lesson for the Cultural Resources Program learned from this project was that the archaeologists needed to be more pro-active about reaching out to the Master Planners and Engineers on a regular basis to request information about their projects and plans. Fort Drum Cultural Resources Program began an outreach initiative called "Even If It's Only a Dream…" This outreach program included office calls, especially in the middle of winter so that the archaeological survey could begin prioritizing the next season's survey priorities. Project questions included proposed footprints, project ideas, alternative locations, associated infrastructure disturbance like borrows, spoil piles, laydown areas, and wetlands mitigation sites, potential year for funding, and potential for ever being built. This type of information has enabled the cultural resources program to be more effective in prioritization of survey efforts and has prevented a recurrence of learning about a spring project after the archaeological field season has ended.

4.3.4 LeRay Mansion Walkway, Fort Drum, New York

In 1940, one of the properties acquired via eminent domain was the LeRay Estate, now the LeRay Mansion Natural Resources and Cultural Center, a National Register listed historic district. The LeRay Mansion was the home of James LeRay de Chaumont son of Jacques Donatien LeRay de Chaumont. Jacques hosted Benjamin Franklin and other members of the US revolutionary government at his home in Passy, north of Paris, and he played a key role in negotiating the French Alliance in support of the Americans against the British in the American Revolution. The LeRay contribution included loans of ships, men, military supplies, and investment in the Continental Congress. When the War ended, Franklin arranged for James LeRay to have an opportunity to address the Continental Congress concerning repayment but to no avail. James married an American and decided to invest what remained of the family fortune in land speculation in northern New York. At one point he and his partners owned hundreds of thousands of acres. A LeRay agent selected a plateau above the Pleasant Creek on what is now Fort Drum as the ideal location for James' personal estate within these holdings (Figure 49). In 1936, Colonel Harold Remington purchased the estate from the bank. He and his spouse completed renovation and restoration, effectively saving the house, between 1936 and 1940 when it was taken by the Army for expansion of Fort Drum for WWII. The Mansion was restored again in 1985 for brief residence by the

10th Mountain Division Commanding General and then managed as Morale, Welfare, and Recreation lodging until 2018 when it was turned over to Public Works, Environmental Division (Figure 50).

Figure 49, Location of LeRay Mansion on Fort Drum (Fort Drum). The walkway location can be seen due north and nearly adjacent to the rear of the structure.

Figure 50. Photograph of the LeRay Mansion taken from the south (Fort Drum).

4.3.4.1 History of Work

From the time Fort Drum established a Cultural Resources Program in the 1980s, the installation has worked hard to manage the LeRay Mansion Historic District in compliance with the Secretary of Interior Standards for Historic Preservation. Stabilization and restoration over the years has

included but is not limited to retrofit of a modern catering kitchen, a comprehensive heating and cooling system, a standing seam metal roof, replacement of two failing columns, installation of a dry pipe sprinkler system, re-plastering, and repair of plaster walls throughout the Mansion, and repair and restoration of chimneys, in addition to exterior improvements like stone steps and walkways. In 2015, the Command Group became concerned about the safety of the stone walkway leading to the formal guest entrances to the structure on the north side after a guest was observed getting a spiked heel stuck in a crack in the limestone. At that point, the walkway consisted of historic limestone blocks approximately 3 ft wide, 4 in. long and 8-12 in. thick. These blocks closely match limestone blocks located in portions of the original basement floor and were assumed to have been quarried from sources of Trenton limestone on the estate. Since that time, thanks to donation of the Harold Remington archives, we have learned that Colonel Harold Remington also salvaged landscape features from an estate in the Mohawk Valley that was being demolished. According to a late nineteenth or early twentieth century photo, prior to installation of the limestone walkway, the north entrance appears to be landscaped with gravel or is serviced by a gravel road so we know that the massive limestone block walkway was not part of the original early nineteenth century LeRay Mansion landscape design plan (Figure 51).

Figure 51. Late nineteenth, early twentieth century view of the north face of the Mansion (Fort Drum). Note gravel driveway or landscaping behind the Mansion guests.

4.3.4.2 Walkway Solution

It was decided that new walkways would be included in a larger Mansion exterior restoration project that would also include new stone steps for the three north entrances, and a decorative iron railing for the handicapped accessibility ramp. This project was a DB project. The CRM worked with the Preservation Architect to specify that the new walkway should be a replacement in kind of the Trenton limestone blocks that were beginning to crack and that were not perfectly fitted, leaving gaps.

The material provided and installed was indeed Trenton limestone, but unfortunately, it was not a replacement in kind (Figure 52). The limestone pavers were spalled rather than cut and were only approximately two inches thick. They did match the local limestone perfectly, but they began to fail immediately upon installation (Figure 53).

Figure 52. Photograph of Trenton Limestone walkway (Fort Drum). It is clear that the walkway pavers are a good match for the original construction stone of the Mansion. For example, compare the pavers with the run of stone just below the pargeting. In retrospect, the historic limestone blocks we were attempting to replace may have been from a different source. The curbing adjacent to the pavers in this image is made from pieces of the walkway we removed, and the two types of stone are clearly not a perfect match. The curbing has also proven to be extremely durable and is cut stone rather than spalled stone.

Figure 53. Photograph showing the deteriorating Trenton Limestone pavers (Fort Drum). This material does match our local limestone, but in this form, it is too friable to serve as a walkway. Some of the pavers cracked during installation, others began to deteriorate during the first freeze thaw cycle after installation. Deterioration was exacerbated dramatically by use of de-icing material, but the walkway was too dangerous to be cleared by using only manual snow and ice removal methods.

4.3.4.3 Cultural Resources Support for Successful Project Completion

Ultimately, it was necessary to remove the spalled pavers, and the decision was made to use stamped concrete. Every effort was made to match the concrete to what an historic limestone walkway is supposed to look like. The stamped concrete was compatible with the surrounding landscape. It is the philosophy of Fort Drum that an historic district requires visitation, use, and appreciation in order to stay alive. One component of that recognition is to make every effort to ensure that visitors are safe and comfortable. As you can see from the sign, the only downside of the stamped concrete is that it is indeed slippery when wet (Figure 54).

Figure 54. Photograph of stamped concrete walkway (Fort Drum).

4.3.4.4 Details in Section 106

Fort Drum consulted with the SHPO prior to implementing this solution and received a comment of "No Adverse Effect." Fort Drum did not consult with their Native American Nation partners on this issue because it did not involve ground disturbance and because they are continuously overwhelmed with consultation requests. Fort Drum chose to be respectful of their time. Nation partners will have had the opportunity to learn about this project in our annual report.

4.3.4.5 Analysis and Lessons Learned

The most important lesson Cultural Resources learned from this project was to be more pro-active and assertive with project contract representatives for projects in and around the Historic District. The CRM should have requested an opportunity to inspect a full-size sample of the pathway material prior to purchase and installation. In addition, the CRM should not have focused so carefully on the quarry source for the walkway material, but rather should have been much clearer about actual required

walkway material specifications, durability, and safety expectations. The CRM and the project contract representatives should have been pro-active about working with the contractor to find an acceptable solution rather than accepting a poor product.

5 Analysis and Lessons Learned

From the site visits and case studies, the researchers analyzed the varying responses and experiences across the services and has summarized them in a lessons learned and best practices format. Since each construction project is unique with different parameters and constraints, this chapter will discuss the pros and cons of the DB and DBB construction processes, as well as outline the steps and tools for historic buildings, new construction, and archaeology as well as provide tips to minimize the impacts of delays and cost increases.

5.1 Summary of findings for DBB

For most historic rehabilitation projects, informal discussions with cultural and construction staff at various service branches led to agreement that the best method is the DBB. This is because the Type A services component of DBB allows for 100% development of a design plan and specifications to ensure historic preservation details and methods are clearly identified. DBB allows for development of qualification requirements for contractor and sub-contractor trades to identify skill levels and experience for primary historic materials such as windows and doors, masonry, and metalwork.

From the regulatory coordination perspective, DBB also has an advantage in providing very detailed design and scoping documents to submit with NHPA Section 106 and/or state historic regulatory mandated consultation. This provides the SHPO and THPO the information they require to make determinations on concurrence. In some circumstances, it may even allow for inclusion of the SHPO and THPO in meetings as the project moves through the design phases, building relationships and trust.

DBB also allows potential issues to be identified prior to a project moving to the construction phase since design documents are developed as a part of the RFP upon which contractors place bids. With information on project specifications and historic requirements clearly spelled out in the RFP, contractors can properly bid the project and develop a team of qualified professionals in preservation methods.

However, it is important to note that a DBB project must not fall into the "one and done" approach to preservation coordination. While the advantage of this process is its ability to provide full design documents for regulatory review under Section 106 of NHPA, it does not mean that preservation coordination is complete. Installation CRM should be integrated as a project team member from beginning to end of a project. The CRM presence can provide input and oversight on the inevitable Request for Information and change orders that happen on most major construction projects. The CRM can keep records of changes and determine the need for notifications to the SHPO/THPO on changes to project scope or previously qualified historic materials contractors and sub-contractors.

The DBB process works best for projects managed by facilities staff at the installation level. This includes the planning and programming office which is responsible for developing the funding requests and timelines for major construction and rehabilitation/maintenance projects, the contracting office putting together the RFP and bid documents and finalizing the contract language, the facilities project managers who implement and oversee the full project execution and completion, and the environmental and cultural resources personnel reviewing and participating in the project team depending on the scope and scale of impacts. Because DBB allows the "owner," in this case, the installation facilities office, to maintain control of the project through all phases of the process, it ensures their input into any unforeseen complications and inadvertent discoveries. This is especially important from the preservation perspective.

The downside to the DBB process is that the costs and timelines for completion are usually much larger and longer than DB. First, there is the cost associated with completing Type A services, which are contracted to a different entity than the subsequent Type B and C services where the construction actually begins. Second, DBB usually awards based on the lowest bid response to the RFP, which seems efficient from a cost analysis. However, most projects then begin to move to a timeline, and it is expected to have change orders and cost adjustments as the project proceeds. The timeline extends because the Owner (i.e., the installation) must review and approve change orders, as well as inspect and approve construction in progress.

However, for complex historic preservation rehabilitation projects, while the extension of timeline and increase in costs are certainly not ideal, they

usually result in a finished product with increased lifespan and overall lower maintenance costs, as long as historic building materials are treated properly to extend their performance and reduce their potential for deterioration or failure. The process lends itself well to development of project teams to follow a project from its design to final punch list. This allows for the CRM to be included in the project from start to finish and ensures historic compliance and best practices to meet the needs of the mission. Often, the installation/facility CRM has cultivated relations with the SHPO and THPO to support efficient review and integration of preservation processes.

5.2 Summary of findings for D-B

DB tends to be applied towards large building projects (MILCON funding) at the DoD level, which often can result in a disconnect between installation staff and the regional and/or nationwide construction/contracting agencies (NAVFAC or USACE, for example) responsible for contract execution. This is particularly challenging when DB is applied to new construction of classes of building types (for example, a hangar, or vehicle storage buildings). Since each installation has different built environments and historic resources, a nationwide project could run into installation specific issues and delays tied to their unique historic districts.

Typically, in DB, the project is scoped for new construction and simply identifies the general requirements of the product sought. For example, a scope might request the design and construction of a 45,000-sf classroom building. The building might require 4 classrooms, 2 offices, 1 gymnasium, 2 locker rooms, 2 sets of restrooms on each floor, and related mechanical, electrical and security specifics. The contractor submits their expertise on construction of classroom or similar buildings. They are awarded a contract and negotiate a set price for the construction. The contractor then becomes the "owner" of the project and can work with the agency via a charrette process to design and solicit input on initial design but then will proceed with management of the construction process from start to finish. The potential for change orders is severely limited and therefore, if issues arise that may impact costs, the contractor may opt to cut certain items and focus on the main deliverables (i.e., the number of classrooms, bathrooms, etc.) of the project.

For a DB to adequately address historic issues, it is important for the scoping document to clearly identify historic preservation coordination

requirements, particularly if it is known that new construction is going into an existing historic district. If there is a design charrette process, it needs to provide for inclusion of the environmental and cultural resources personnel from an installation early in the project, particularly when a project is managed at a national or regional level.

While it may be rare for a DB to occur in situations involving rehabilitation or maintenance, the Texas Military Department Building 38 case study shows a quasi-DB process wherein an existing warehouse building needed conversion to serve as administrative offices. Limited funds and timelines meant the project had to begin with interior demolition while a limited design plan was developed to construct the basic interior office space plan until funding was available for contracting the electrical, mechanical, and plumbing work. In this situation, the CRM served on the project team from its inception to assist the Texas Military Department in complying with historic federal and state regulations while avoiding project stoppages and delays. If this project had been managed at a regional/national level, it would be critical to identify the installation/facility level subject matter experts to ensure compliance with the regulations.

5.3 Recommendations at CRM Level

In any of the construction processes employed by an installation or regional/national office, the participation of the CRM as a subject matter expert is critical from not only a regulatory compliance perspective but for a successful project completion to create a solid and enduring structure. Not every DoD installation or facility has a subject matter expert CRM. CRMs may be archaeologists or historians without an architectural specialty, it is important to identify the best practices to ensure compliant and successful preservation projects. This is especially important when the CRM is a "collateral duty" position where the CRM is also the Pest Manager, the Safety Officer, et cetera.

5.3.1 Installation CRMs

DoDI 4715.16 requires installations to have a CRM and an ICRMP (unless no historic properties are present). The CRM and/or ICRMP should establish the processes for early notification and involvement on new construction projects, as well as major and minor maintenance projects. Many agencies focus on the coordination of Section 106 of the NHPA as the main duty and responsibility of a CRM office. Although ICRMPs are often

underutilized, DoD policy states that they are required to be "Integrated" Cultural Resource Management Plans. As such, it is imperative that a CRM office integrate itself with the internal stakeholders at the installation/facility and the national/regional level to support the mission and preserve the significant properties they are tasked with managing.

A CRM should become familiar with their installation/agency master planning process and/or annual work plans. These documents provide the CRM with the long-range work planned and will allow any issues with historic properties to be identified even before a project is presented to a CRM office for standard environmental review (depending on the agency, this is generally submitted in funding documents requests). If there are regular project review meetings happening for new construction and major maintenance, CRM personnel should be attending them or at least reviewing meeting minutes to identify potential historic property coordination requirements. For minor maintenance, most installations and agencies have a work order system through which tenants submit requests. It is important for the CRM to have access to the system to review requests and/or to supply the maintenance team with a list and map of historic structures/districts and provide educational resources/training to them on historic materials and standards.

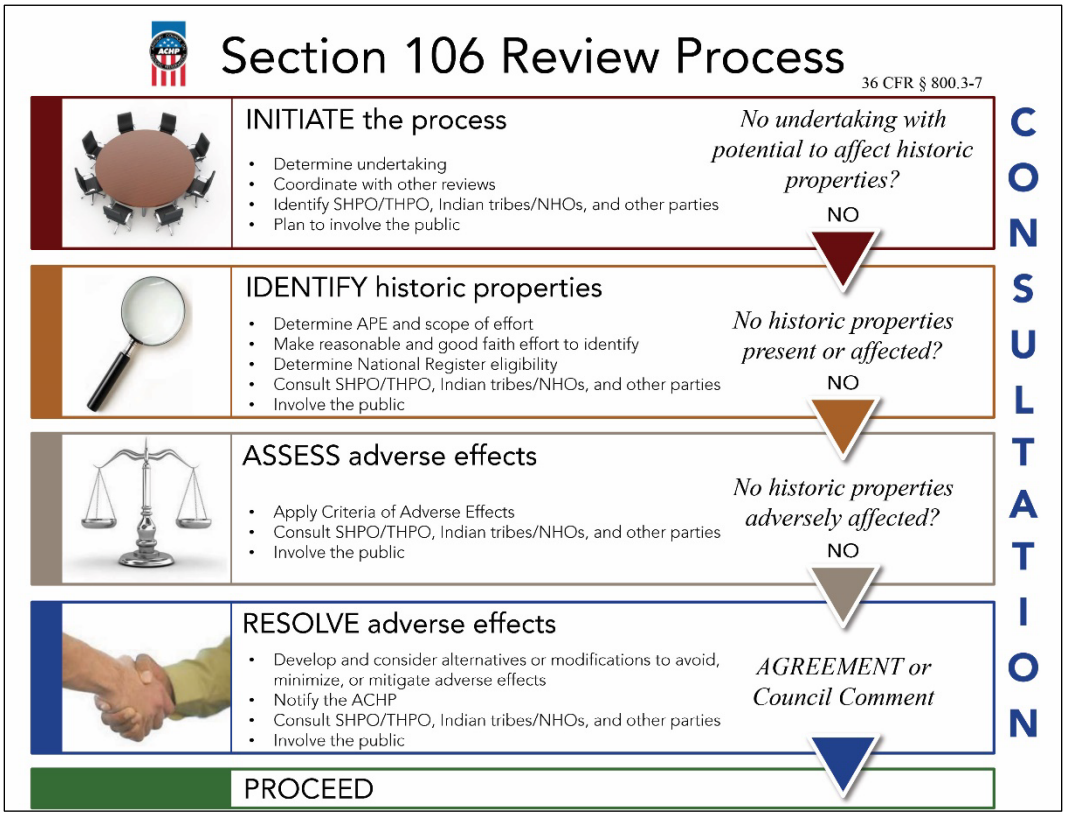
The ICRMP document can also include the lists and maps of historic structures, archaeological sites, and districts (although it is important to note that archaeological site information is restricted and should only be disseminated per the guidance set by CRM and SHPO and THPOs. More importantly, the ICRMP should include detailed SOPs to cover processes with roles and responsibilities identified for installation personnel, the CRM, and external stakeholders like the SHPO and THPOs. SOPs and/or Best Practices should include guidance on historic materials treatments as appropriate, for instance cleaning and repairing historic masonry, inadvertent discovery of historic materials during minor maintenance projects (i.e., removal of carpet reveals original wood flooring) and proper procedures for project (i.e., undertaking) notification for Section 106 NHPA review.

In situations where there is a CRM in a "dual hat" position (a Natural Resources Manager designated CRM) or a CRM with no architectural background and/or no information on structures impacted in a project, it is important to identify a subject matter expert at the regional or national

level (such as NAVFAC or USACE) that can assist with compliance on projects. These offices may provide the support necessary to a proposed project.

The goal is for CRMs to avoid the very real issue of a project arriving on a CRM desk as a finished product with no ability to address any issues that may delay the requested 30-day Section 106 coordination. It is important to note that this is not the intent of the NHPA law. CRMs need to be proactive and establish relationships with their facilities and maintenance colleagues to integrate their role into project planning, contracting and execution so that the consultation can occur at all stages as outlined in the ACHP Section 106 Review Process (Figure 37).

Figure 55. Flow chart showing steps of Section 106 process (ACHP).



5.4 Recommendations at the Installation Project Management Level

Project managers at installations balance a wide range of issues on major construction. Installation maintenance personnel have to prioritize and respond to a wide range of work order requests. However, both sets of personnel are also important partners in historic preservation. Each group

plays a critical role in supporting successful cultural resources regulatory compliance and protection of historic materials.

As can be seen from the site visits and case studies, a critical issue in every example was when and how a CRM professional was included in a project timeline. The earlier a CRM joins the planning process of an activity, the smoother the coordination on the legal side and the more efficiently and effectively a project involving historic property can be completed. Therefore, it is recommended that project managers and maintenance personnel become more familiar with where the CRM is located, whether on the installation or at the regional/national level. ICRMP documents should be provided to these personnel, or a modified summary of relevant sections of the ICRMP (for instance, SOPs or Best Practices) made available. Ideally, the CRM will provide training on an annual or quarterly basis to educate installation project and maintenance personnel on the location and requirements for historic structures and/or districts.

On major construction projects, the designated project manager should work closely with the CRM and include them on the project team. The project manager should set timelines and expectations with the CRM on coordinating regulatory compliance. They should also include the CRM on the review and approval of contractors, methods, and products related to historic materials. At the Texas Military Department, the project manager includes a CRM professional in reviewing and approving historical work during construction. For example, the CRM will review and approve the process to penetrate mortar with anchors for structural supports. In addition, the CRM professional is included on the punch list and final walk through on any major historic property project.

In situations where the CRM does not have a background in architecture, it is critical for the project managers or maintenance team to have established processes and practices for historic materials and/or a clear point of contact at regional/national level to consult with on historic property projects. Scopes of works on projects at these installations need to include requirements for contractors to include a sub-consultant to serve as a preservation expert or coordinator to complete required regulatory documents such as NHPA 106 consultation.

5.5 Recommendations at Installation Contracting Level

Installation/facility contracting offices have responsibility to ensure all projects are compliant with fiscal rules and include all specifications and requirements to allow a fair bidding process for potential contractors. Therefore, it is important for the CRM and/or environmental office to educate contracting officers and personnel on language related to NEPA, NHPA and any other environmental or cultural resources regulatory rules applicable on major or minor construction projects. This is critical because often if an emphasis is on best value, i.e., lowest bidder, it creates long term issues in cost and timeline as awarded contractors will argue the RFPs did not include requirements for qualified and experienced professionals in trades related to historic materials.

Therefore, it is important to provide the same training and awareness on ICRMP documents, design guidelines or other historic property requirements to contracting staff as well as project managers. RFP language should include the technical specifications for historic materials treatments that may be included for security, electrical and other components of a major construction or rehabilitation project. Particularly in situations where there is no designated CRM, contract language should include specs to allow budgets for historic resources professionals to handle the coordination responsibility for the project.

5.6 Recommendations at DoD Contracting Level

When writing guidance and policies to help CRMs at installation level, make sure the ICRMPs contain the appropriate contracting language in both a regulatory manner and in SOPs. In addition, service regulations should be reviewed specifically looking at the mention of roles and responsibilities in the master planning processes, the contracting processes, the NEPA processes, and the Section 106 processes. Each individual CRM can do their best but if there is not an overarching process at the top, then each will have varying results. Ideally, the next DODI update will include this kind of planning and contracting language.

5.7 Training

People cannot be expected to implement what they are unfamiliar with. A construction manager may only be aware that a building is “old,” not understanding what the legal definition of “historic” means or the laws and

regulations associated with the status. Training provides an opportunity to educate installation and facility personnel on the regulatory requirements and processes driving preservation programs. It is a common refrain that many view historic structure requirements as complicated and often will move forward under the motto "better to ask forgiveness later." However, often times, this can result in a more costly endeavor, whether because a particular window repair failed and allowed water to penetrate a building or because modern mortar was used to infill a historic brick wall and the SHPO office identifies it as an adverse impact and requests a costly mitigation.

It is important to bear in mind that installation/facility project managers must deal with such a wide range of regulations and technical expertise, that efficiency in training on preservation issues needs to be targeted, concise and presented in the context of their own profession. Too often, the CRM trainings developed by CRMs becomes very complex and technical, focused on a particular issue when the attention needs to be on the forest rather than the trees.

5.8 Successful Preservation

In this comparison of two different construction processes across DoD, the goal was to identify if one was perhaps "better" than the other in terms of successful outcomes in historic projects. While no method was definitively "preferred" over the other, it is certainly clear from the various examples the most successful efforts included a professional CRM participation in a project from beginning to end regardless of construction process used. From the case studies and site visits, there seems to be a preference toward DBB for rehabilitation projects as it better supports clearly defining preservation standards and workmanship qualifications and allows for early consultation with SHPO and other consulting parties. Regardless of construction process employed, there are a number of "tools" to construct (pun intended) a successful preservation project. Below are listed some tools for successful preservation practices.

5.8.1 Preservation Staff on Installation/Facilities

Most DoD installations with historic structures, particularly those with districts, benefit from designating qualified professional staff to serve as CRMs. As detailed in the Legacy *Cultural Resources Job Descriptions and Position Classification Standards* report, CRM staff should meet the

Secretary of the Interior's Historic Preservation Professional Qualification Standards.[131] In situations where an installation has a large number of historic buildings and/or districts, it is especially important to hire not only an architectural historian but to also recommend that at least one architect within an installation design or facility office have qualifications as a historic architect. When it is not feasible or an installation is not large enough to warrant a full-time subject matter expert, the regional/national office for the service branch should ensure that Secretary of Interior qualified experts in historic buildings and structures are available to review and support projects. At the minimum, projects planned for historic structures and/or districts should have contract language to ensure contractors provide Secretary of Interior qualified professionals to coordinator and support a project.

5.8.2 ICRMP Documents

ICRMP plans can be often underutilized, but under DoD policy they are required to be integrated with all aspects of managing the installation. ICRMP documents are meant to serve several different audiences including the project and maintenance personnel working at an installation or facility. Therefore, the following steps will improve awareness and application of the ICRMP.

1. ICRMP Summaries: The ICRMP is one large document covering a wide range of cultural resource issues, but it should also include "stand alone" sections that can be provided to specific stakeholders. For instance, CRM should create a standalone table/map of historic structures and districts along with relevant SOPs and/or best practices or design guidelines. These can be provided to the installation project managers and maintenance personnel for their easy review and access.

2. ICRMP training: CRM should create 20-30 minute training module on the ICRMP and provide training online and/or in-person via PowerPoint slide deck.

[131] Megan W. Tooker, Dawn A. Morrison, and Adam D. Smith, *Cultural Resources Job Descriptions and Position Classification Standards* (Washington D.C.: DoD Legacy Resource Management Program (Legacy 15-713), 2018).

3. Routine ICRMP updates: CRM needs to update ICRMP annually with any newly designated historic structures and/or districts. Any changes to processes or treatments should be included and shared with relevant stakeholders.

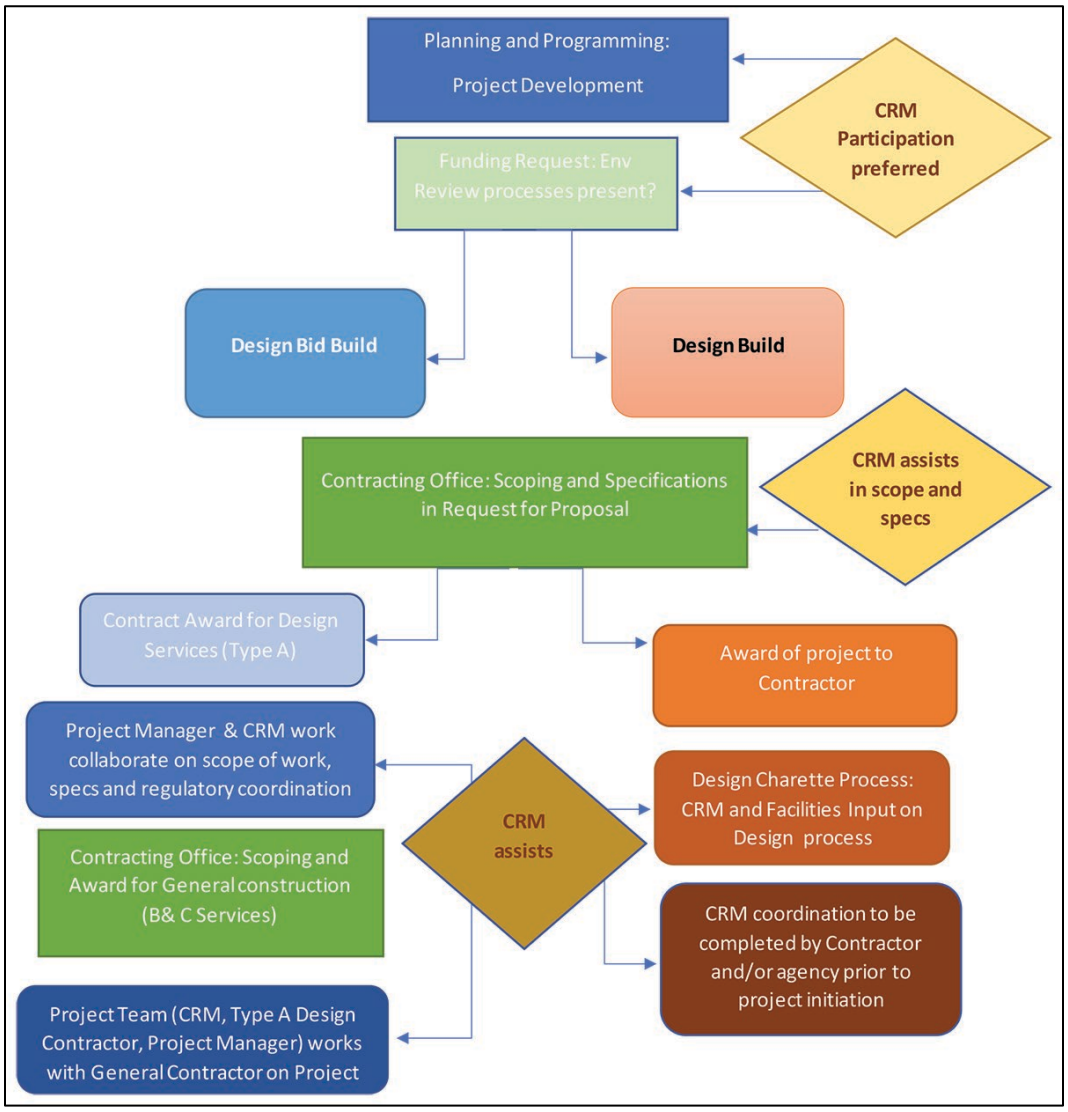
5.8.3 Standard Contracting Language

CRMs should work with contracting offices to complete standard templates for historic property requirements and specifications and contracts. In addition, contracting offices should look to see if any IDIQ or long-term contracts can be developed to obtain qualified historic property construction and project professionals to handle specific projects. This saves time and effort in locating and securing qualified professionals.

5.9 Conclusion

Both DB and DBB have their place in military rehabilitation and construction projects, but the installations and the services need to be cognizant that each method has its flaws and holes in regard to the consultation process. Below is a flowchart showing the best steps for the construction process (Figure 40). Nevertheless, for all this to work, everyone at all levels has to be included in the process. The construction organization and the contracting organization cannot work without the CRM. In addition, the CRM needs to work with the contracting officer. The contracting office should never let out a contract that may affect historic properties without consulting the CRM. In addition, the construction and maintenance project managers need to notify and work with the CRM when dealing with historic structures and districts, not only from the compliance perspective under NHPA but also to implement the best solutions to preservation projects.

Figure 56. Flow chart of best practices.



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Abbreviations

ACHP	Advisory Council on Historic Preservation
ADA	Americans with Disabilities Act
A/E	Architects/Engineers
AGC	Association of General Contractors
AIA	American Institute of Architects
ALARNG	Alabama Army National Guard
APE	Area of Potential Effect
ARPA	Archaeological Resources Protection Act
ATFP	Anti-Terrorism Force Protection
BRAC	Base Closure and Realignment Commission
CATX	Categorical Exclusion Determination (also CATEX, CX, CE)
CCC	Civilian Conservation Corps
CERL	Construction Engineering Research Laboratory
CFMO	Construction and Facilities Management Office
CMAA	The Construction Management Association of America
CPM	Critical Path Method
CRM	Cultural Resources Manager
DBB	Design-Bid-Build
DB	Design-Build
DBIA	Design-Build Institute of America
DoD	Department of Defense

DOT	Department of Transportation
DPW	Department of Public Works
DSW	Definable Scope of Work
EA	Environmental Assessment
ECS	Existing Condition Survey
ERDC	Engineer Research and Development Center
EIS	Environmental Impact Statement
HABS	Historic American Buildings Survey
HAER	Historic American Engineering Record
HSA	Historic Sites Act
HSR	Historic Structure Report
GC	General Contractor
GIS	Geographic Information System
GMP	Guaranteed Maximum Price
IDIQ	Indefinite Delivery/Indefinite Quantity
LiDAR	Light Detection and Ranging
MCB	Marine Corps Base
MILCON	Military Construction
NAGPRA	Native American Graves Protection and Repatriation Act
NAFAC	Naval Facilities Engineering Systems Command
NBK	Naval Base Kitsap
NEPA	National Environmental Protection Act
NHL	National Historic Landmark

NHPA	National Historic Preservation Act
NPS	National Park Service
NRHP	National Register of Historic Places
PERT	Program Evaluation and Review Technique
PA	Programmatic Agreement
POW	Prisoners of War
RFP	Requests for Proposals
SHPO	State Historic Preservation Officer
SOPs	Standard Operating Procedures
THC	Texas Historical Commission
THPO	Tribal Historic Preservation Officer
TXARNG	Texas Army National Guard
USACE	US Army Corps of Engineers
WPA	Works Progress Administration