General Monitoring and Discovery Plan for the City of Phoenix, Maricopa County, Arizona

Prepared for

City of Phoenix

City Archaeology Office
Parks and Recreation Department
Pueblo Grande Museum
4619 E. Washington Street
Phoenix, Arizona 85034

Pueblo Grande Museum Project No. 2017-009

Project Report No. 19-120
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ABSTRACT

Report Title: General Monitoring and Discovery Plan for the City of Phoenix, Maricopa County, Arizona

Project Name: General Monitoring and Discovery Plan Update

Project Location: Phoenix, Maricopa County, Arizona

Project Sponsor: City of Phoenix

Sponsor Project Number(s): None (Pueblo Grande Museum No. 2017-009)

Lead Agency: City of Phoenix

Other Involved Agencies: Arizona State Historic Preservation Office; Arizona State Museum

Applicable Regulations: City of Phoenix Historic Preservation Ordinance (Zoning Ordinance Chapter 8); Arizona Antiquities Act (ARS §41-841 et seq.); Arizona state burial laws (ARS §41-844 and ARS §41-865)

Funding Source: City

Description of the Project/Undertaking: Provide an updated general monitoring and discovery plan for the city of Phoenix

Project Area/Area of Potential Effects (APE): Lands inside the boundary of the city of Phoenix and city-owned facilities that lie outside this boundary; acreage to be established by individual projects conducted under this updated plan

Legal Description: To be established by individual projects conducted under this updated plan

Land Jurisdiction: As determined by individual projects conducted under this updated plan

Total Acres: Not applicable

Consultant Firm/Organization: Desert Archaeology, Inc.

Project Number: 18-165C

Eligible Sites: Not applicable

Ineligible Sites: Not applicable

Unevaluated Sites: Not applicable

Comments: This general monitoring and discovery plan has been updated to reflect current knowledge about archaeological cultural resources within the city of Phoenix, as well as managerial considerations. The plan provides a consistent approach to the treatment of archaeological cultural resources within the city and is provided to streamline the historic preservation consultation process by identifying a set of approved field and research methods for monitoring and discovery situations for the city of Phoenix.

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LIST OF ACRONYMS

ADOT	Arizona Department of Transportation
APE	Area of Potential Effects
ARPA	Archaeological Resources Protection Act
ASM	Arizona State Museum
BIA	Bureau of Indian Affairs
CAO	City Archaeology Office
CCC	U.S. Civilian Conservation Corps
CNRP	Sky Harbor Airport Community Noise Reduction Program
FAA	Federal Aviation Administration
FHA	Federal Housing Administration
FHWA	Federal Highways Administration
HUD	U.S. Department of Housing and Urban Development
MOA	Memorandum of Agreement
NAGPRA	Native American Graves Protection and Repatriation Act
PGM	Pueblo Grande Museum
SHPO	Arizona State Historic Preservation Office
SSI	Soil Systems, Inc.
WPA	Works Progress Administration

ACKNOWLEDGMENTS

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Reviews and comment were also provided by James Marshall and Greta Halle, City of Phoenix Streets and Transportation Department; Erin Davis and Mary-Ellen Walsh, Arizona State Historic Preservation Office; Barnaby Lewis, Gila River Indian Community; Shannon Twilling, Claire Barker, and Cristin Lucas, Arizona State Museum; Kris Powell, Arizona Department of Transportation; Lauren Jelinek and David Gifford, U.S. Bureau of Reclamation; Jennifer Elsken, U.S. Federal Highways Administration; and Daniel Grijalva, U.S. Army Corps of Engineers.

GENERAL MONITORING AND DISCOVERY PLAN FOR THE CITY OF PHOENIX, MARICOPA COUNTY, ARIZONA

INTRODUCTION

This document presents a general plan for archaeological monitoring and discovery within the city of Phoenix (Figure 1). The purpose of the plan is to provide a consistent approach to the treatment of archaeological cultural resources within the city and to streamline the historic preservation consultation process by identifying a set of approved research and field methods for monitoring projects and discovery incidents for the city of Phoenix. For this plan, cultural resources include prehistoric or historic archaeological sites or prehistoric canals, but not historic buildings or traditional cultural properties.

Applicable Regulations and Administration

The protection and management of archaeological cultural resources in the city is regulated through Chapter 8 of the Phoenix Zoning Ordinance, also known as the "Historic Preservation Ordinance of the City of Phoenix" (City of Phoenix 2015:21). All development or infrastructure projects that are city sponsored, occur on city land, or undergo planning review, including private developments, are assessed by the City Archaeology Office (CAO) for potential impacts to archaeological sites or canals. If impacts are anticipated, the CAO will determine the appropriate level of archaeological investigation—monitoring, testing, or data recovery—based on the location, extent, and depth of ground disturbances associated with the proposed development or construction activity. Monitoring is most often utilized when proposed disturbances will be shallow (less than 3 ft in depth) or limited to trench, pothole, or auger exposures (Bostwick 2006). The City Historic Preservation Office serves a similar role in the assessment of elements of the historical built environment, such as historic (older than 50 years) buildings, sites, structures, objects, and districts.

The CAO also ensures compliance with state laws protecting archaeological resources. These include the Arizona Antiquities Act (ARS §41-841 et seq.) and two state burial laws (ARS §41-844 and ARS §41-865). The Arizona Antiquities Act, administered through the Arizona State Museum (ASM) Permits Office, requires that no person or organization shall knowingly excavate in an archaeological site on lands owned or controlled by the state (including county and municipal lands), except when permitted by the director of the ASM. That is, an Arizona Antiquities Act permit authorized by the ASM director is required for any organization that conducts or oversees excavations within an archaeological site, as in the case of monitoring, inside the limits of Phoenix or any city-owned facility that lies outside the city boundary. All stipulations of the Arizona Antiquities Act permit are to be followed by organizations working under this general monitoring and discovery plan.

The intent of the state burial laws is to ensure the protection, respectful treatment, and repatriation of human remains found on state and private land in Arizona. ARS §41-844 protects human remains, funerary objects, sacred ceremonial objects, and objects of national or tribal patrimony found on city, county, or state land. ARS §41-865 protects human remains and funerary objects found on private land. The Repatriation Office at ASM coordinates consultations with tribal and descendant groups for planned projects when there is a reasonable expectation that human remains may be encountered. The CAO maintains a city-wide Burial Discovery Agreement to facilitate compliance with the burial laws for projects conducted by the city.

The CAO also manages all city-sponsored archaeological projects that involve federal or state undertakings to ensure compliance with the National Historic Preservation Act of 1962, as amended (NHPA)

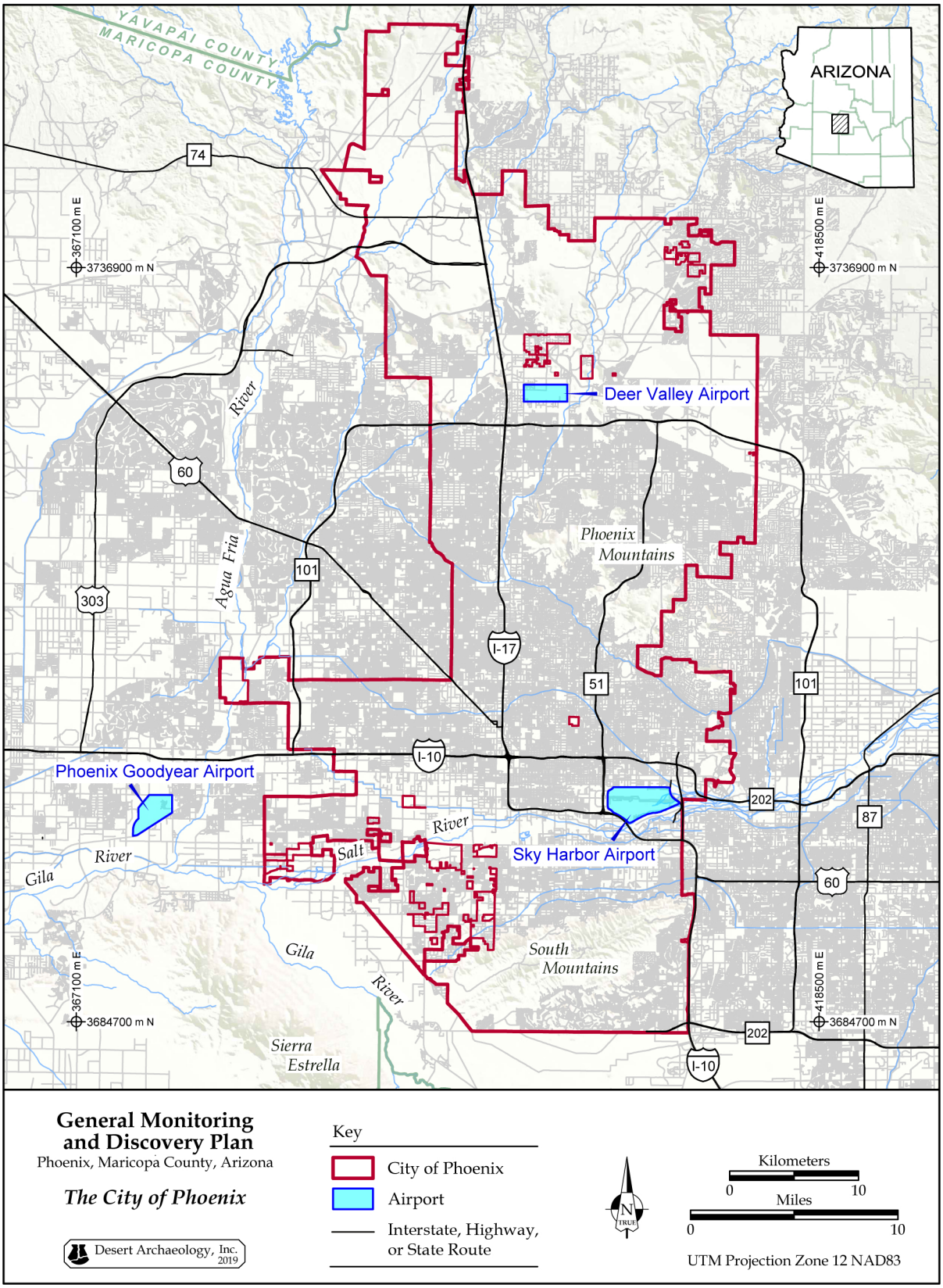

Figure 1. Location and limits of the city of Phoenix, Arizona.

or the State Historic Preservation Act (ARS §41-861 et seq.), as appropriate. The office provides reviews and participates in consultation at the request of the federal and state agency. The State Historic Preservation Office (SHPO) has primary oversight of compliance obligations relative to these statutes.

Use of the Monitoring and Discovery Plan

In consultation with ASM, SHPO, and city department's staff, the CAO identifies the following types of projects for which this general monitoring and discovery plan may be used: (1) city-sponsored projects on city land and on private land, including Housing and Urban Development (HUD) funded, Federal Aviation Administration (FAA) approved, Federal Highway Administration (FHWA) funded local government, and U.S. Army Corps of Engineers permitted projects; (2) city-permitted, city-sponsored, or other utility projects in city right-of-ways; (3) private developer projects within city right-of-ways or on private land; and (4) projects involving city-owned facilities inside and outside the city of Phoenix boundary, such as Goodyear Airport.

Examples of project types for which this monitoring and discovery plan could be used include the following: (1) city residential rehab projects that involve repairs or upgrading of single-family or multiple unit residences; (2) street or sidewalk improvements; (3) water and utility line installations; (4) routine maintenance of city facilities; (5) city facility utility upgrades; and (6) city parks renovation and development, such as construction of new ramadas, restrooms, or trailhead improvements.

Whereas this plan is not generally written for federal projects that occur within the city boundary and that are not city sponsored, federal agencies may request permission in writing from SHPO and the CAO to utilize the plan. This request can be made via email. Note that any archaeological work conducted on federal lands would be subject to requirements of the Archaeological Resources Protection Act of 1979 (ARPA) and the Native American Graves Protection and Repatriation Act (NAGPRA).

Organization of the Plan

The remainder of this plan is presented in five primary sections: (1) Environmental Context, which provides descriptions of the physiographic and ecological traits that once typified the Phoenix area; (2) Cultural Context, in which a cultural history for the city of Phoenix is presented; (3) Archaeological Resources of the City of Phoenix, which provides more in-depth discussions of cultural resources types that may be encountered during monitoring projects; (4) Research Design, which identifies research topics and questions that could be realistically addressed through archaeological monitoring; and (5) Work Plan, which supplies a general set of procedures and methods to be used during city-directed archaeological monitoring projects.

ENVIRONMENTAL CONTEXT

Phoenix today is such a highly developed urban area that many find it hard to believe that traces of past inhabitants remain buried below the buildings, pavements, and landscaping that now populate the city. Yet continued excavation projects have demonstrated the presence of buried archaeological resources even below such heavily disturbed areas as present-day downtown Phoenix and the lands within Phoenix Sky Harbor International Airport (see, for example, Aguila 2007; Hackbarth 2010, 2012; Henderson, ed. 2003). Although now obscured by urban development, it was largely attributes of the natural landscape that first drew people to settle in the area. This section provides descriptions of the environmental characteristics that once typified the Phoenix area, with an emphasis placed on physiographic and ecological aspects that relate to local prehistoric and historic cultural occupations.

Phoenix extends across the lower Salt River Valley and into the northern uplands in the central portion of the Phoenix Basin (Figure 2), a part of the larger Basin and Range physiographic province (Thornbury 1965). As defined by Péwé (1978), the Phoenix Basin extends from the Mazatzal-Superstition Mountains area on the east to the general area of the Hassayampa River and the Buckeye Hills on the west, and from the Hieroglyphic Mountains and New River Mountains on the north to the Sierra Estrella Mountains and Sacaton Mountains to the south. The Phoenix Basin is inclusive of the lower Salt River Valley, the middle Gila River Valley, the lower Verde River Valley, and the Queen Creek Delta. The lower Salt River Valley is more restricted to the area between the confluences of the Salt River with the lower Verde River and the middle Gila River to east and west, and the South Mountains north to the Hieroglyphic Mountains and the New River Mountains.

The region is characterized by isolated fault-block mountain ranges separated by broad alluvial valleys, most filled with several thousand feet of unconsolidated sediments shed from surrounding mountains and alluvium from major streams (Graybill and Nials 1989; Péwé 1978). The Salt River is the primary drainage in the valley, with tributary streams including the Agua Fria River, New River, Skunk Creek, and Cave Creek, which cross the northern and western extents of Phoenix. Local ranges include the South Mountains, which bound the southern end of Phoenix, and the Phoenix Mountains, spread across the center. Other notable prominences include Papago Buttes, rising immediately north of the Salt River at the eastern end of Phoenix, and Hedgpeth Hills and Union Hills, in the northwestern extent of Phoenix.

Local topography is generally flat, sloping gently to the southwest north of the Salt River and north to northwest south of the river. Valley elevations range from 1,500 ft above sea level along the northern and eastern margins to 1,000 ft along the western margin. Elevations of the mountain ranges vary from 2,600 ft in the South Mountains and Phoenix Mountains to slightly more than 4,000 ft in the McDowell Mountains and White Tank Mountains outside of Phoenix proper.

River terraces have been identified along the Salt River and most of the larger tributaries in the lower Salt River Valley (Péwé 1978). Péwé (1978) recognized four paired terraces (named Lehi, Blue Point, Mesa, and Sawik, from youngest to oldest) along the Salt River east of Tempe, but these terraces converge to the west and disappear beneath sediments associated with coalesced alluvial fans and pediment formation (Graybill and Nials 1989), notably those of the Papago and Cave Creek pediments to the north and those derived from the South Mountains to the south. The broad expanse and low gradient of the river terraces above the active Salt River channel provided excellent terrain for the construction and use of prehistoric and historic canals.

The Salt River was tapped by extensive sets of hand-dug irrigation canals beginning in approximately the first century AD, and for the next 1,400 years, the agricultural productivity of irrigated fields supported the growth and expansion of the cultural group known by archaeologists as Hohokam. In the late 1860s, the potential to restore some of the ancient canals was realized, and soon thereafter, the waters of the Salt River were producing crops and attracting new settlers, leading within a few years to the establishment of several of the area's historical townsites, including Phoenix.

The climate of the Phoenix Basin is hot and arid, typical of the Sonoran Desert (Sellers and Hill 1974). Average annual precipitation is 8–10 inches, although it varies substantially, ranging from as few as 5 inches to 20 inches per year. Precipitation is biseasonal, with violent localized thunderstorms experienced during the late summer months (July and August) and gentler broader winter storms from December to March (Graybill and Nials 1989). Winter temperatures tend toward moderate highs and lows with only occasional frost; daytime highs from mid-June to mid-September often exceed 100 degrees Fahrenheit. The region generally remains frost-free from early March until mid-November, providing a lengthy growing season.

Phoenix is located in the Lower Colorado Valley subdivision of the Sonoran Desertscrub biotic community (Turner and Brown 1994), although the attributes of this biome have been largely obliterated by

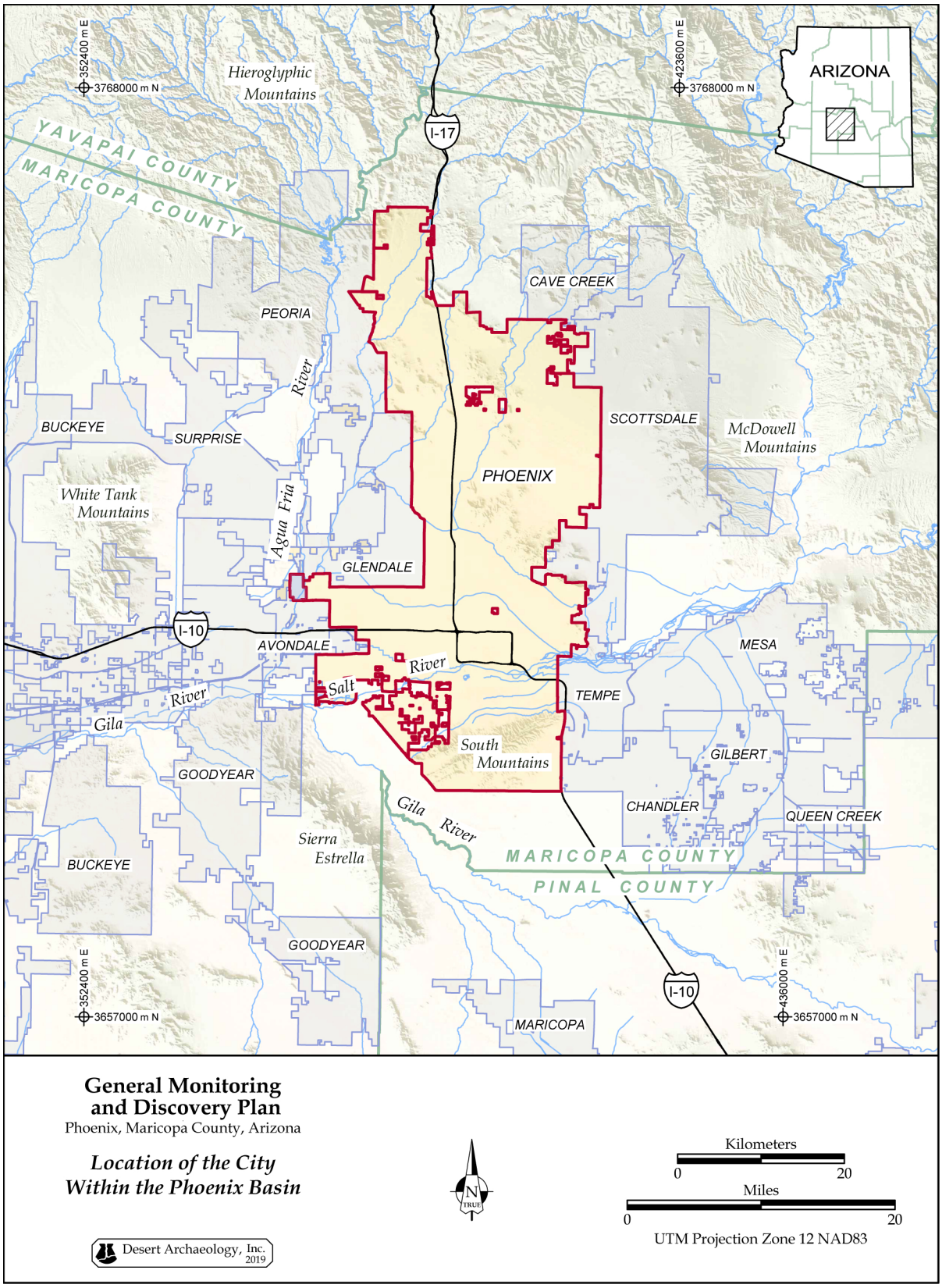

Figure 2. Location of the city of Phoenix within the Phoenix Basin.

historical agricultural development and modern urbanization. Prior to construction of historical dams in the early 1900s, when the lower Salt and Agua Fria Rivers still flowed perennially, native species found along the floodplains included moderate to dense stands of cottonwood, desert willow, and mesquite interspersed with reeds, saltbush, and wild grasses. Outside the floodplain, native vegetation on the alluvial terraces and lower bajadas was dominated by a creosotebush-bursage community with prickly pear and cholla cactus, saltbush, grasses, and forbs also present. Washes likely supported a variety of cacti, as well as paloverde, ironwood, and mesquite shrubs. Plant species characteristic of the Arizona Uplands subdivision of the Sonoran Desertscrub—saguaro, paloverde, ironwood, ocotillo, barrel and fishhook cactus, creosotebush, and brittlebush—persist today at the higher elevations of Phoenix's mountain parks and preserves.

A wide variety of animal species are associated with these plant communities (Lowe 1964; Turner and Brown 1994), including mule deer, coyote, bobcat, kit and gray fox, jackrabbits, cottontail rabbits, ground squirrels, gophers, desert mice, rats, and bats, as well as reptile species including chuckwalla, rattlesnake, and desert tortoise. Common birds include Gambel's quail, mourning doves, Gila woodpeckers, red-tailed and other hawks, turkey vultures, and burrowing and horned owls. The Salt River and low-lying marshy areas undoubtedly supported populations of fish, turtles, frogs, and toads (James 1994) and would have attracted large numbers of seasonally migrating birds.

CULTURAL CONTEXT

Human occupation of Arizona extends from the break between the Pleistocene and Holocene epochs, circa 12,000 years BP, to the present day. Although evidence for a human presence throughout this time is currently tentative in the Phoenix metropolitan area, the possibility for encountering remains from any period of Arizona's occupation cannot be discounted. A cultural history for the city of Phoenix is broadly sketched here. This history supplies a summary of events and processes that influenced human occupation within the lower Salt River Valley and the Phoenix area in particular. A chronology for the valley is summarized in Table 1.

Paleoindian Period (10,000–7500 BC)

The Paleoindian are the earliest human occupants of Arizona. Traditionally viewed as small, highly mobile groups of big-game hunters, the Paleoindian are thought to have roamed portions of the Southwest from approximately 12,000 to 10,000 years ago. The period is primarily manifest in Arizona by isolated surface finds of Clovis points and several Pleistocene megafauna kill sites in southeastern Arizona (Haynes 1980; Huckell 1982; Mabry 1998). The low population size of the Paleoindians contributes to the rarity of their material remains, as well as a tool kit that contained few diagnostic artifacts. In addition, the extreme antiquity of the period limits the number of sites that have survived. Although no Paleoindian sites have been located in the Phoenix metropolitan area, evidence for the presence of these early Arizona inhabitants has been found in the lower Agua Fria River area. This evidence consists of three isolated Clovis points found on alluvial terraces east and west of the Agua Fria (North et al. 2005). North and others (2005) suggest these finds may indicate the Agua Fria River and its tributary New River served as primary north-south travel corridors for these highly mobile groups.

Archaic Period (7500 BC–AD 1)

The transition from the Paleoindian period to the Archaic period was accompanied by marked climatic changes. During this time, the environment came to look much as it does today. Archaic period groups pursued a mixed subsistence strategy, characterized by intensive wild plant gathering and the hunting

Table 1. Cultural chronology for the lower Salt River Valley.

Period	Phase	Date Range[a]
Historic	Emerging Metropolis	AD 1945–1973
	American Statehood	AD 1912–1945
	American Territorial	AD 1863–1912
Protohistoric	–	AD 1500–1863
Hohokam Classic	Polvorón	AD 1375–1500
	Civano	AD 1300–1450
	Soho	AD 1150–1300
Hohokam Sedentary	Late Sacaton/Santan	AD 1070–1150
	Middle Sacaton	AD 1000–1070
	Early Sacaton	AD 950–1000
Hohokam Colonial	Santa Cruz	AD 850–950
	Gila Butte	AD 750–850
Hohokam Pioneer	Snaketown	AD 700–750
	Estrella/Sweetwater	AD 650–700
	Vahki	AD 500–650
	Red Mountain	AD 1–500
Late Archaic/Early Agricultural	–	2100/1500 BC–AD 1
Middle Archaic	–	4800–2100/1500 BC
Early Archaic	–	7500–4800 BC
Paleoindian	–	10,000–7500 BC

[a]Prehistoric date ranges are drawn from Mabry (1998) [Paleoindian]; Huckell (1996) [Early–Middle Archaic]; Huckell (1990) [Late Archaic/Early Agricultural]; Mabry (2000) [Hohokam Red Mountain phase]; Abbott (2009) [Hohokam Vahki through Late Sacaton phases]; Fish and Fish (2008) [Hohokam Soho and Civano phases]; and Chenault (2000) [Hohokam Polvorón phase]. The Historic dates reflect the creation of the Arizona Territory in 1863, the year Arizona achieved statehood through the end of World War II; post-World War II date range after Collins (2005).

of small game animals. This pattern of wild resource exploitation resulted in a high degree of residential mobility, low population density, and a widely dispersed settlement pattern.

Huckell (1996) proposed three temporal subdivisions for the preceramic Archaic period in the American Southwest: Early Archaic (7500–4800 BC), Middle Archaic (4800–1500 BC), and Late Archaic (1500 BC–AD 1). Although no Early Archaic sites have been identified elsewhere in the lower Salt River Valley, Graves et al. (2009) report the presence of several Early Archaic features in a site, AZ T:11:94(ASM), located at the confluence of the Agua Fria and the Salt River. In contrast, Middle and Late Archaic remains appear to be thinly but widely spread across bajada and upland settings in the Phoenix Basin. Notable sites include AZ T:7:419(ASM) (Falcon Landing) (Wegener and Hall 2017) in the western periphery, AZ U:5:33(ASM) (Last Ditch site) (Hackbarth 1998; Phillips et al. 2001; Rogge 2011, 2015) in the northern periphery, and AZ U:1:25(ASM) (Brown's Ranch Rock Shelter) (Wright 2002) and Fountain Hills sites (Stubing and Mitchell 1999) in the northeastern periphery of the basin. Each of these sites appears to represent multiple, intermittent, short-term occupations by small groups of foragers to primarily collect and process wild plant resources, a pattern that continued into the Hohokam era, and in the case of Brown's Ranch, into the Protohistoric period.

Beginning about 2100 BC, Archaic land-use patterns changed in many parts of the Southwest after the introduction of maize agriculture, prompting reclassification of the Late Archaic as the Early Agricultural period (Huckell 1990; Mabry 2002). At this time, horticulture became an important part of the subsistence base in some areas within southern Arizona, particularly the Tucson Basin (Gregory 2001; Huckell et al. 1995). While occupations contemporary with the Late Archaic have produced evidence of early agriculture elsewhere in Arizona, preceramic agricultural settlements have not been identified to date in the lower Salt River Valley.

Hohokam Sequence (AD 1–1500)

The most commonly found archaeological site in southern Arizona belongs to the Hohokam[1] cultural tradition (AD 1–1500). This ancient culture is best known for several traits, including fully sedentary villages, multigenerational habitation sites, limited-activity sites, extensive canal systems, public architecture, and a rich, diverse artifact assemblage that included red-on-buff and red-on-brown pottery (see Fish and Fish 2008). Although Hohokam material remains may be found across southern Arizona, the area above the confluence of the Salt and Gila Rivers, the Phoenix Basin, is viewed as the center, or "core," of the tradition (Wilcox 1979). The availability of water and arable land along these two perennially flowing streams was undoubtedly the major attraction for the irrigation-based Hohokam culture, contributing to its fluorescence in this area.

Moving away from this core, along the tributary drainages to the Salt and Gila Rivers and uplands surrounding the river valleys, are geographical zones that archaeologists have described as peripheries (Gumerman and Spoerl 1980; Wood and McAllister 1980; cf. McGuire 1991). The extent to which these areas evince Hohokam culture varies across time and space, although they typically never display the richness of the core.

The Hohokam cultural sequence is divided here into four broad periods, the first of which is the Pioneer period (AD 1–750), initially manifest in the Red Mountain phase (AD 1-500) (Cable and Doyel 1987; Mabry 2000). Salient characteristics of the time included the presence of small agricultural settlements composed of clusters of variably sized and shaped pithouses (see Mabry 2000), the widespread use of plain ware ceramic containers, and the construction of the first irrigation canals in the lower Salt River Valley (Henderson and Clark 2004). AZ T:12:70(ASM) (Pueblo Patricio), located in downtown Phoenix, could be considered the "type" site for the Red Mountain phase (Cable, Hoffman, Doyle, and Ritz 1985; Henderson 1995), although additional sites to the east along the Salt River and lower Verde River facilitated the definition (see Hackbarth 1992; Henderson 1989; Morris 1969). Cable and Doyel (1987:21) explicitly identified the phase as "the earliest manifestation of Hohokam culture in the region." However, others suggest the phase is more appropriately viewed as representative of a pan-regional, pre-Hohokam plain ware tradition, classified temporally as the Early Ceramic period (Lindeman and Wallace 2004; Wallace et al. 1995).

The adoption of irrigation agriculture in the early centuries AD paved the way for the rapid growth of Hohokam populations after AD 500. The first primary villages, distinguished initially by a central plaza surrounded by house clusters and later by other forms of public architecture (ballcourts, platform mounds), appeared during the Vahki phase (AD 500–650). Each of these villages was associated with at least one major canal system that brought river water onto the upper alluvial terraces. Examples in Phoenix include AZ U:9:1(ASM) (Pueblo Grande), AZ T:12:1(ASM) (La Ciudad), AZ T:12:148(ASM) (La Villa), located on the north side of the Salt River, and AZ T:12:137(ASM) (Las Canopas), on the south side of the Salt River. The appearance of these ancestral villages was followed by a rapid expansion of small and large habitation centers and irrigation systems across the valley during the late Pioneer and subsequent Colonial period (AD 750–950) (Doyel 1991; Doyel and Fish 2000; Howard 1991a). New settlements appeared, and earlier Pioneer period villages grew even larger; it is about this time that the first clear evidence is found for occupation of the Agua Fria and New River drainages.

The Colonial period is characterized not only by an expanding population, but also by increasing complexity within Hohokam society. Pithouses were clustered into discrete courtyard groups—recognized as the material manifestation of households—which, in turn, were organized into larger village seg-

[1]"Hohokam" is an archaeological term that refers to a culture and people from a specific period in time, and is not to be confused with *Huhugam,* an O'dham word for all O'odham ancestors, including those known to archaeologists as the Hohokam. *Huhugam* refers to past human life and is improperly used if referring to objects such as archaeological sites. Nevertheless, according to oral tradition, the Hohokam are ancestors of the historic Akimel O'odham (Pima) and Tohono O'odham peoples in southern Arizona (after Lewis 2009; see also Lewis and Rice 2008).

ments, each with distinct roasting areas and cemeteries (Henderson 1987; Howard 1990; Wilcox et al. 1981); cremation was the dominant burial practice. Around AD 800, ballcourts were built at the largest villages (Wallace 1999, 2014). Their presence is thought to represent the emergence of a regional system with religious, economic, and political functions, tied together by the exchange of plain and buff ware ceramics, marine shell, foodstuffs, and other items (Abbott 2009; Doyel 1991; Wallace 2014; Wilcox 1991; Wilcox and Sternberg 1983). Canal irrigation was widespread during the Colonial period, although evidence suggests many peripheral settlements also engaged heavily in dry and floodwater farming (Crown 1991; Doyel and Elson 1985).

Settlements across the region continued to increase in number and size during the Sedentary period (AD 950–1150). New primary canals were added to existing irrigation systems, while others were newly established (Howard 1987, 1991a). At the settlement level, fieldhouses, farmsteads, hamlets, villages, and multisettlement "communities" have been recognized (Crown 1984; Gregory 1991; Henderson 1989). Significant population growth in the northern periphery of the valley is also indicated by increased numbers of permanent habitation sites and the development of large villages and community centers along the Agua Fria and New Rivers (Dove 1970, 1984; Doyel and Elson 1985; Weaver 1974).

Organizational changes within Hohokam society are signaled toward the end of the Sedentary period when ballcourts were abandoned and platform mounds became the principal form of public architecture. House clusters were arranged in more formalized rectangular patterns that forecast the development of the supra-household adobe-walled compounds seen in the Classic period (Gregory et al. 1988; Wilcox et al. 1981). Fieldhouses, once prevalent across the irrigated landscape above the Salt River, began to disappear suggesting changes in the organization of agricultural labor (Henderson and Clark 2004). Some archaeologists argue this time of transition would be best framed in a reinstated "Santan phase" (AD 1070–1150) (Doyel 2000; see also Cable and Mitchell 1989; Gladwin 1937; Mitchell 1989).

The Classic period (AD 1150–1500) is marked by dramatic changes in Hohokam material culture, architecture, and traditions. Surface adobe-compound architecture appeared for the first time, supplementing, but not replacing, the tradition of semisubterranean pithouse architecture. Burial modes also changed, with an increasing dominance of inhumation over cremation burial. Buff ware pottery diminished in frequency during the Classic period, being replaced by red ware pottery and, later, polychrome types. Ballcourts were largely abandoned during the late eleventh century (Wallace 2014), and sometime around the late thirteenth century (Gregory 1987), massive-walled platform mounds were constructed at large villages throughout much of the Hohokam region. Because construction of these features required considerable levels of organized labor, many think the mounds are symbols of a socially differentiated society (Doelle et al. 1995; Elson 1998; Fish and Fish 1992; Gregory 1987). The appearance of large multi-storied adobe structures, known as "Big Houses" or "Great Houses" at a very few of the largest villages in the later Classic period, reinforces the suggestion of increasing social and/or political differentiation across the period (Wilcox 1991; Wilcox and Shenk 1977).

The period is also characterized by substantial changes in settlement pattern. Ancestral villages like AZ U:13:1(ASM) (Snaketown) and AZ AA:2:2(ASM) (Grewe) in the middle Gila River Valley were abandoned; other settlements such as AZ T:12:10(ASM) (Las Colinas) and Las Canopas in the lower Salt River Valley were reorganized. Large tracts of land across the region, including the northern reaches of the Phoenix Basin, were depopulated, while areas like the Queen Creek Delta saw an influx of populations. Within the larger central Arizona region, the Hohokam aggregated into fewer, but larger villages as the Classic period progressed.

A late Classic or post-Classic occupation, labeled the Polvorón phase (AD 1375–1500), has been identified at a few sites in the northern Phoenix Basin (Chenault 1996; Crown and Sires 1984; Sires 1984). The "phase" is represented by small clusters of pithouses, sometimes constructed on top of apparently abandoned adobe-walled residential compounds and even on platform mounds. Unfortunately, dates assigned to Polvorón phase features largely overlap those of recognizable Civano phase features, even

within the same site, confounding interpretation of the so-called "post-Classic" Polvorón phase phenomena (Craig 1995; Henderson and Hackbarth 2000; cf. Chenault 2000). Regardless of this interpretive quandary, population clearly declined steadily in the lower Salt River Valley and the larger Phoenix Basin after the mid-fourteenth century, and by the mid- to late fifteenth century, material traits that distinguished the Hohokam cultural tradition are no longer found in the archaeological record.

Protohistoric Period (AD 1500–1863)

Little is known of the period between roughly AD 1500 and the appearance of Spanish explorers in the late sixteenth and seventeenth centuries. However, when the Spanish first arrived, O'odham (Piman) peoples were well established in the middle Gila River region (Bolton 1948; Dunne 1955; Riley 1987), Pee Posh (Maricopa) populations were living along the Gila River from Gila Bend to its confluence with the Salt River (Harwell and Kelly 1983; Spier 1933), and semi-nomadic Yavapai and Apache groups are known to have exploited upland regions surrounding the lower Salt River Valley (Gifford 1936; Whittlesey et al. 1997). Early historic accounts suggest O'odham and Pee Posh settlements were loosely organized collections of round, brush-covered houses, generally located in riverine settings. Each small village seems to have been politically autonomous, self-sufficient, and focused on floodwater agriculture. The less-settled Yavapai and Apache shared an economic system that blended hunting, gathering, farming, and raiding. Settlement focused on small groups of extended families who were seasonally transhumant.

While the middle Gila River area north to the Gila-Salt confluence was occupied throughout the Protohistoric period, there were no villages along the lower Salt River because it had become a contested zone between the territories of the O'odham and Pee Posh and their adversaries, the Yavapai and Apache, to the north and east (Dunne 1955; Hackenberg 1974; Spier 1933). While Euro-American settlers argued that the valley was absent of indigenous settlement (Cable and Doyel 1986; Luckingham 1989), there are reports of O'odham fishing parties along the Salt River, and small O'odham/Pee Posh groups used the valley for hunting, mesquite gathering, and similar activities that would have left little trace in the archaeological record. Yavapai are also known to have occupied the valley's upland areas during the early Historic period (Gifford 1936), and Schroeder (1974) argues their occupancy extends into the Prehistoric era. Among the few reported Protohistoric period traces of this group is mention of possible Yavapai reuse of a Hohokam agricultural site along the New River (Green 1989) and use of rockshelters and some open-air camps in the McDowell Mountains (Darby 2011, 2012; Whittlesey et al. 1997; Wright 2002). In addition, excavations at AZ T:12:47(ASM) (Pueblo Salado) in Phoenix revealed a possible Protohistoric Piman structure (Bostwick et al. 1996).

The O'odham and Pee Posh adapted peacefully to the arrival of Euro-Americans. They expanded their farms to supply food to the newcomers, and by the mid-1800s, they were characterized as a nation that had become an economic force and virtually the only effective military resistance against the Apache (Ezell 1983). In 1859, the United States set aside a reservation for the O'odham and Pee Posh along the middle Gila River. Upstream from the reservation, new Euro-American settlers laid claim to farmland and began to divert the flow of the Gila River to their fields. By the early 1870s, heavy diversion of water by these settlers, exacerbated by a general drought, caused conditions of mass starvation on the Gila Reservation, forcing many O'odham and Pee Posh to relocate to the Salt River area (Webb 1959), where another reservation was established in 1879. Today, the O'odham and Pee Posh reside on the Gila River Reservation, now the Gila River Indian Community, south of Phoenix, and on the Salt River Reservation, now the Salt River Pima-Maricopa Indian Community, adjacent to Scottsdale and Mesa.

Historic Period (AD 1863–1973)

Although the Historic period begins with the Spanish occupation of southern Arizona in the late seventeenth century, there was no large movement of American settlers into the lower Salt River

Valley until the 1860s. This movement followed the acquisition of Arizona by the United States under the terms of the 1848 Treaty of Guadalupe del Hidalgo, ending the Mexican-American War, and the Gadsden Purchase of 1853. The discovery of gold in the Bradshaw Mountains in 1863 was the primary catalyst for settlement in the Salt River Valley. The influx of miners seeking their fortunes in the Prescott and Wickenburg areas brought the U.S. military to protect them from Apache and Yavapai natives, whose lands were being appropriated. Among the military camps established was Camp McDowell (later Fort McDowell) on the lower Verde River just north of its confluence with the Salt River (Luckingham 1989; Mawn 1977). The increasing demand by the soldiers and miners for food and forage provided prime opportunity for settlers to exploit the agricultural potential of the lower Salt River Valley.

The first of these settlers was John Y. T. Smith, who was master of transportation for the U.S. 14th Infantry quartered at Camp McDowell in 1865. Having observed abundant native grass growing along the Salt River, he negotiated a contract in 1867 to supply the fort with hay. Smith promptly established a wild hay harvesting camp on the north bank of the Salt River on land now occupied by Sky Harbor Airport (Mawn 1977; Stein 2016). He hired Mexican workers to cut the hay, raised cattle, and, with his workers, blazed a road to Fort McDowell. His success at this venture enabled him to start businesses, including construction and operation of a local flour mill, and engage in politics in later years. While serving as Speaker of the House in the Arizona Legislature, he was influential in moving the territorial capital to Phoenix in 1889 (Stein 2016).

A visitor to Smith's hay camp in September of 1867 was John W. (Jack) Swilling, a former Confederate soldier and deserter, Union Army freighter and scout, and Arizona prospector, farmer, and speculator (Luckingham 1989). There, he observed the traces of the ancient canals extending from the Salt River. Acting upon the notion that these alignments could be revitalized, he returned to his then-home in Wickenburg and formed the Swilling Irrigating Canal Company (Mawn 1977; Stein 2016; Zarbin 1978). In late 1867, Swilling and his partners moved to the valley and began to excavate a canal head on the north side of the Salt River west of Papago Buttes, with the intention of connecting it to the channel of an old Hohokam canal (Cable and Doyel 1986; Zarbin 1978). Bedrock was encountered almost immediately, so to save time and money, Swilling's party moved roughly 3 miles downstream and excavated their irrigation canal north of Smith's hay camp (Luckingham 1989; Mawn 1977). Crops of wheat, barley, and corn irrigated by the Swilling Ditch were first harvested in the spring of 1868. From this point forward, irrigation agriculture would be the driving force for development across the Salt River Valley until the modern era.

The success of Swilling's venture attracted new settlers, and within fewer than two years, additional canals had been dug and a small dispersed settlement had formed in the vicinity of Swilling's homestead. It was known as the "Phoenix Settlement," and it supported a post office, a few businesses, and a flour mill. The name "Phoenix" was chosen to evoke the image of a new civilization rising from the ruins (or ashes) of the ancient Hohokam (Barney 1933; Mawn 1977).

As the local farming community grew, the need for an official and permanent center for trade and commerce was voiced. Following some dispute among community leaders (Barney 1933; Luckingham 1989), the original Phoenix townsite was finally established in the 0.5-square mile area bounded by present-day Van Buren Street, 7th Street, Harrison Street, and 7th Avenue (Figure 3). The townsite was platted by Captain William Hancock in 1870, which established 98 blocks measuring 300 ft^2 within the 320-acre area. Two central blocks were reserved as public plazas for a county courthouse and a city hall (Mawn 1977); the eight blocks abutting the plazas formed the original business district. The remaining 88 blocks were subdivided into 12 lots that measured 50.0 ft by 137.5 ft, except the column of blocks on the eastern and western edges of the townsite where the blocks had two fewer lots (Hackbarth 1995). The lots in the 88 blocks were further separated into two rows by an east-west alley, which contributed to the uniform growth of the townsite's central core (Mawn 1977).

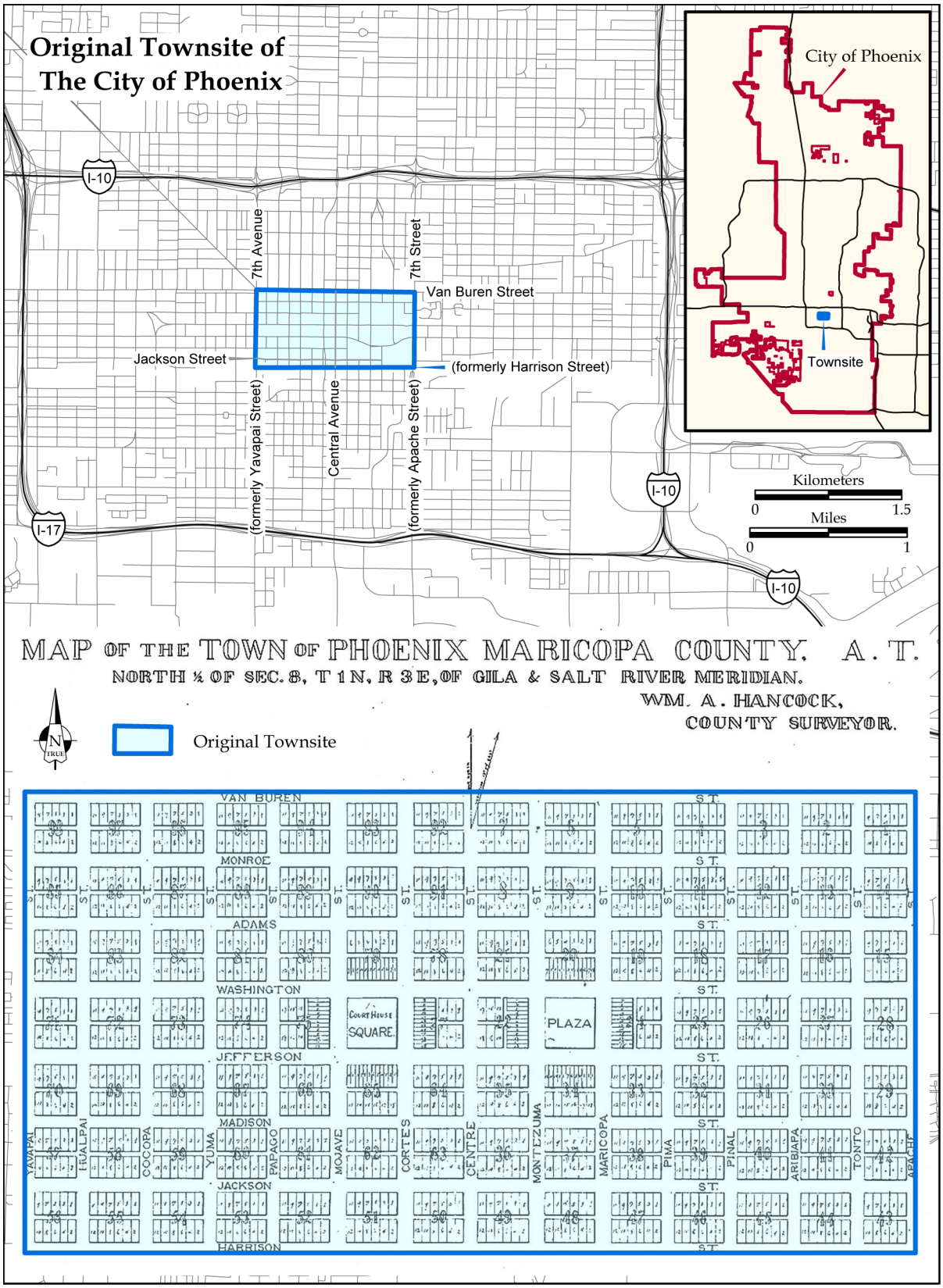

Figure 3. Location and map of the original Phoenix townsite.

Town lots were first auctioned in December 1870. The first business was Hancock's Store, housed in an adobe building that also served as the town hall, county seat, and meeting place (Barney 1933)[2]. The first church was built in 1871, a schoolhouse in 1873, and the first bank in 1878. In a sign of the times, 16 saloons and several gambling parlors were established by 1875; the largest building in the townsite was a brewery (Luckingham 1989). The commercial core of downtown Phoenix expanded rapidly and, within 10 years, covered approximately 16 blocks. Washington Street was the prime commercial location encouraging further business along its corridor (Henry and Ritz 1984; Luckingham 1989). By 1881, when the city was incorporated, the townsite had become the hub from which most future development would follow.

As the town expanded, so too did the canal systems that underlay this growth. A second canal, Frenchy's Ditch south of the Swilling Ditch, was also operating by the spring of 1868. In late 1868, the head of the Swilling Ditch was enlarged, and the canal was remodeled to include a northern branch (Northern Extension, later, the Maricopa Canal), a main branch (Town Ditch, later the Salt River Valley Canal), and a southern branch (Dutch Ditch) (Hackbarth 1997). All were irrigating crops by 1870 and would be further consolidated in the 1884 construction of the Joint Head Canal and Joint Head Dam, ironically located near the same point Swilling intended to originally build his canal.

In 1878, the Grand Canal was constructed to carry water even farther north and west of its predecessors. This 27-mile-long canal followed the contour of a prehistoric canal, north of and parallel to the Maricopa Canal, until striking west to terminate at the New River (Aguila 1998). Similar canal building efforts were underway during this time on the southern side of the Salt River. As seen in the Phoenix area, these south-side canals spurred the appearance of pioneer settlements in the Tempe (circa 1870–1872) and Mesa (circa 1877) areas.

The growth of Phoenix in the 1880s and 1890s was influenced by several events. The first of these was the arrival of the Maricopa & Phoenix Railroad, a feeder line to the Southern Pacific, which established direct service to Phoenix in 1887. This railroad extended east-west south of present-day Jackson Street; freight and passenger depots were built at Apache (now 7th Street) and Railroad Avenue (now Jackson Street). Industries developed near the depots to take advantage of commercial opportunities —iceworks, a planing mill, a flour mill, and hay and grain warehouses, among others (Stein 2016). The industries drew workers; some built homes near their places of employment, while others gained a commuting option in 1887, when what became the Phoenix Street Railway Company began operating a mule-drawn line along Washington Street and, later, along Central Avenue (Fleming 1977; Stein 2016). The streetcar system, electrified in 1893, continued to expand, both encouraging and supporting the creation of new subdivisions in Phoenix well into the first two decades of the twentieth century (Fleming 1977; Luckingham 1989).

The presence of the railroad and associated facilities along the southern edge of the original town in conjunction with massive Salt River floods in 1890 and 1891, which inundated the city as far north as Madison Street, pushed the direction of growth northward. More affluent residents left the southern areas of the town to establish homes north along Central Avenue north of Washington Street and adjacent to the Grand Avenue diagonal, away from the industrial and flood-prone areas of the town (Stein 2016). Warehouse and industrial facilities associated with the railroad continued to accumulate and served as a barrier to southward expansion. The area south of the railroad remained largely an agricultural landscape well into the twentieth century.

In 1882, a group of land developers, led by W. J. Murphy, formed the Arizona Canal Company to construct a new canal to open additional areas of land for irrigation, settlement, and speculation. Unlike the earlier Phoenix canals, whose heads were concentrated near the original settlement, the Arizona Canal headed from a dam (Arizona Dam, later the Granite Reef Diversion Dam) on the Salt River about

[2]Maricopa County was officially carved out of Yavapai County in 1871, with Phoenix designated the county seat.

1 mile south of the Verde River. The new canal traversed portions of what would become the Salt River Pima-Maricopa Indian Community, downtown Scottsdale, Phoenix's Arcadia and Sunnyslope neighborhoods, Glendale, and Peoria before ending at the New River; it opened up more than 100,000 new acres of land for potential cultivation.

Following completion of the Arizona Canal and Dam in 1885, Murphy and other land speculators established the Arizona Improvement Company to aid their land development plans. By the mid-1890s, Murphy's company had consolidated almost all the local farmer-owned canal companies under the Grand Canal, held possession of thousands of acres of land, was involved in the founding of the towns of Alhambra, Glendale, Peoria, and Marinette, and had established citrus and fruit production as an important facet of the Salt River Valley's agricultural economy (Murray and Weight 2009).

The Arizona Improvement Company's plan to capitalize on their investments was enhanced by the 1895 arrival of the Santa Fe, Prescott & Phoenix Railway from Ash Fork, Arizona, west of Flagstaff. With links to markets in northern Arizona and the transcontinental railroad at Ash Fork, this railroad, in conjunction with the earlier Maricopa & Phoenix Railroad, firmly established Phoenix as the market center for the larger central Arizona area with ready connections to northern, western, and eastern markets. Phoenix promoters viewed the city as the future metropolis of the Arizona Territory, and in 1889, they convinced the territorial legislature to move the capital from Prescott to Phoenix (Luckingham 1989).

Founders of the Arizona Improvement Company were also instrumental in bringing a federal Indian school to Phoenix. Although the new school was supposed to be located at Fort McDowell, W. J. Murphy and associates suggested the Bureau of Indian Affairs (BIA) might prefer to establish its school in Phoenix. The promoters were interested in much more than Indian education; they controlled large sections of land and were well aware that a federal school would boost the local economy and encourage real estate development (Trennert 1993).

The Phoenix Indian School was founded in 1891 and established in a 160-acre area extending northeast from the intersection of modern-day Central Avenue and Indian School Road. The school brought Native Americans from throughout the Southwest and Pacific Coast to provide an education that attempted to assimilate them into the dominant Euro-American white culture by overt denial of their language, religion, and cultural heritage (Lindauer 1996). This BIA-operated school served all grades from 1891 to 1935, and subsequently served as a high school until it was closed in 1990 by the federal government.

By the turn of the twentieth century, central Phoenix exhibited all the trappings of a modern city: multistory brick buildings, paved city streets, water and sewer systems, firefighters and police officers, and a public library. The streetcar system continued to provide a valuable commuting service to Phoenix residents. In 1902, two hydroelectric power plants constructed on the Arizona Canal began providing electricity to Phoenix. Despite these improvements, there was one critical aspect limiting growth in the Phoenix area—a reliable supply of river water. The floods of the early 1890s, followed by severe drought in the latter part of the decade, forced thousands of acres out of cultivation.

Resolution of this instability came in the form of the National Reclamation Act of 1902. This congressional act established the Reclamation Service and provided funding for reclamation projects with low interest government loans. Valley farmers formed the Salt River Valley Water Users Association in 1903 to secure funds for the purpose of constructing a dam and lake farther upstream at the confluence of Tonto Creek and the Salt River. This project, one of the first reclamation projects under the act, was approved by the Secretary of the Interior in 1903. Construction of Roosevelt Dam began the following year and was completed in 1911, ensuring a stable water supply. The federal commitment to construction of the dam and the anticipated boom in the economy and local population were undoubtedly factors that influenced Congress to grant Arizona statehood on February 14, 1912 (City of Phoenix 2015).

The completion of Roosevelt Dam and granting of statehood launched a period of substantial growth in Phoenix and the larger Salt River Valley. In 1910, Phoenix had a population of 11,150 and was the third largest city in the territory; by 1920, the population had more than doubled to 29,100 and Phoenix became and would remain Arizona's largest city. A progression of new residential subdivisions expanded the borders of the city, primarily north, but also east and west. Members of the working class and minority families also began to populate the southern sections of Phoenix, south of the railroad. "Downtown" Phoenix remained the governmental and business center, expanding especially along Central Avenue, while small-scale industrial facilities continued to populate locations south of Washington Street.

The entry of the United States into World War I in 1917 had a major effect on the valley. While population growth slowed, a demand for certain agricultural products increased. Long-staple cotton was essential to the war effort for the manufacture of tires, balloons, and airplane fabric, and the valley was an ideal site for its production. Reclamation projects on the Salt River further improved irrigation, enabling the expansion of other agricultural and related industries. Citrus soon became the major cash crop of the region. Increased production of hay and alfalfa supported the growth of cattle ranches around the state. As the cattle industry grew, so too did the local meat-packing industry. Opened in 1919, the Tovrea Stockyards west of 48th and Van Buren Streets accommodated more than 300,000 cattle each year, making it the world's largest feedlot. Demand for copper also was high, and as mining regions prospered, the demand for goods and services supplied from Phoenix increased. Record levels of agricultural and commercial production resulted in increased population and corresponding expansion within the city limts (City of Phoenix 2015).

Two notable events pertaining to preservation occurred amidst the building boom of the 1920s. The land that is now home to the Pueblo Grande Museum and Archaeological Park was donated to the city of Phoenix in 1924. A museum was built on site shortly thereafter, and, in the late 1920s, Phoenix employed a Museum Director/City Archaeologist, becoming the first city in the nation to have a designated city archaeologist. Thanks, in part, to these early preservation efforts, the park and museum were listed on the National Register of Historic Places (National Register) and declared a National Historic Landmark in 1964.

In 1924, the city purchased 14,000 acres of South Mountain from the federal government to develop as a municipal park. Development of the park was greatly enhanced by the Depression-era New Deal program, the U.S. Civilian Conservation Corps (CCC). Between 1933 and 1940, several thousand men worked out of two camps at South Mountain Park to construct more than 40 miles of hiking and equestrian trails and construct more than 200 buildings, ramadas, fire pits, water faucets, water dams, and other features in the park. The slab stone masonry architectural style for the buildings was consistent with the National Park Service's use of regionally traditional themes utilizing environmentally compatible materials.

Automobiles, which first appeared in Phoenix in the first decade of the twentieth century, had become the preferred mode of transportation by the late 1920s. Their numbers prompted further expansion and paving of streets; by 1930, paved roads connected virtually every neighborhood within the city. Highways, notably U.S. Highway 80, were also being constructed, providing new links to Phoenix and the lower Salt River Valley. A local airport established in 1928 was bought by the city in 1935; Phoenix Sky Harbor Airport would provide yet another engine of growth, especially in the years after World War II.

Phoenix was not exempt from the effects of the Great Depression of the 1930s, although not all of those effects were negative. The tremendous building boom of the 1920s collapsed for a time but was reinvigorated with the creation of the Federal Housing Administration (FHA). FHA loans facilitated the modernization of existing homes and the construction of new ones. By the close of 1935, Phoenix led 109 cities nationwide in FHA loan applications (Collins 1999). In addition to the work in South Mountain Park, the CCC provided funding for excavations at Pueblo Grande Museum and Archaeological Park between 1935 and 1940, as did the federal Works Progress Administration (WPA) (Downum

1993), which also supported the archaeological Salt River Valley Stratigraphic Survey conducted by Schroeder (1940) (see also Bostwick 1993).

By 1939, war industries throughout the country ramped up production, and restrictions on domestic construction were being imposed. In the long run, World War II proved an unexpected boon for Phoenix, as related industries and military bases were located in the valley to take advantage of its connected location and a climate well suited to training and production. By the end of the war in 1945, Phoenix boasted six military facilities, two major air bases, three training fields, and a naval air station. Entire communities of houses, stores, and businesses had been built to serve the military and civilian population associated with these military posts and war-related industries (City of Phoenix 2015).

A construction and economic boom followed the end of the war. Many military personnel who had been stationed in the valley during the war moved back with their families, stimulating development of residential subdivisions and the growth of suburbs and smaller cities within the Phoenix metropolitan area. Government-insured mortgage funding through the FHA and the Veterans Administration played a large role in making home ownership viable for most working and middle class families.

Farmers across the valley began to subdivide and/or sell their land to make way for residential and commercial developments, a trend that continued well into the 1970s. New residential developments ranged from relatively small subdivisions containing fewer than 30–50 lots to massive subdivisions such as John F. Long's master-planned Maryvale community and Del E. Webb's Sun City retirement community. Strip malls and a relatively new amenity, the enclosed shopping mall, began to emerge across the valley to support the growing populace. Phoenix's own Uptown Plaza, Park Central, Thomas Mall, and Chris-Town all opened their doors in the late 1950s. The mega-mall, Metrocenter, opened in 1972. A. J. Bayless and the Basha brothers, Azez and Eddie, opened grocery stores across the valley, with these often anchoring a strip mall. Motorola remained a dominant industry, joined during the 1950s and 1960s by General Electric, Kaiser Aircraft and Electronics, Goodyear Aircraft, and Sperry Rand. The central financial and business center shifted "uptown" along Central Avenue, an area soon marked by multiple skyscrapers (Collins 2005; Luckingham 1989).

While suburban development was rapidly increasing, the downtown area began to decline. Retail sales within the central business district dropped dramatically during the period, such that a newspaper reporter described the city center as a mercantile graveyard. City officials acted to reverse this urban decay in the 1960s by revitalizing the downtown. Portions of the slums downtown were razed to provide room for the Phoenix Civic Plaza, a downtown complex extending from Monroe Street to south of Washington Street between 2nd and 5th Streets. Construction of the Civic Plaza was planned to increase the downtown's cultural offerings, which, by September 1972, included two exhibit halls, north hall meeting rooms, and a symphony hall (Hackbarth et al. 2010).

City services in Phoenix tried to keep pace with the population gains and suburban expansions. City utilities, including police and fire protection, were upgraded, and new streets, sewers, parks, and public buildings appeared. Bus lines replaced the earlier streetcars, although buses proved unpopular, as most Phoenicians preferred to travel in automobiles. In 1951, the city charter established a public health director and the city's authority for collection and disposal of solid waste. Trash dumping and trash burning was prohibited across the city; all was to be collected by the city and disposed of in city and county landfills. Local leaders began discussions about a freeway system and water development program, both of which would see fruition in the late 1970s and 1980s.

In 1955, the City Council recognized the need to greatly broaden its tax base to provide for the types of services and facilities that a large city needs. In the following year, the Council approved a basic plan for growth that included a stepped-up program of annexation and development of a long-range capital improvement program to address current and future needs of the growing city. Citizens displayed their faith in the Phoenix government by voting millions of dollars in bonds for necessary improvements across the later decades of the twentieth century (Luckingham 1989).

In 1950, the city of Phoenix covered 17.1 mi^2, which included a small area that extended south from the Southern Pacific Railroad (superseded the Maricopa & Phoenix Railroad) only as far as Interstate 10 (superseded U.S. Highway 80) between 24th Street and 22nd Avenue north of the Salt River. This area contained a mixture of warehouses, small stores and shops, and residential neighborhoods containing large proportions of Hispanic and/or African-Americans, along with Chinese-Americans. Additional predominately Hispanic neighborhoods or barrios were present to the east and west outside the city's boundary. Most of these neighborhoods were established in the 1930s and 1940s.

By 1970, the city had annexed a massive area (248 mi^2 total) that included most of present-day Phoenix south from the Salt River to South Mountain Park. Most of these newly incorporated lands had been settled by Mexican Americans, whose farms and residences persisted through the period of annexation; the area also contained large enclaves of Asian and African Americans. The reader is referred to the *Hispanic Historic Property Survey* (Dean and Reynolds 2004), *African American Historic Property Survey* (Dean and Reynolds 2006), and *City of Phoenix Asian American Historic Property Survey* (Murray and Solliday 2007), as well as Stein's (2016) "Sky Harbor and Its Neighbors: Archival Study for the CNRP-VARS Project, Phoenix, Maricopa County, Arizona" for more information about the histories of these ethnic groups in Phoenix. In addition, Luckingham (1989) refers to these various ethnic groups, as well as Native Americans, throughout his book, *Phoenix. The History of a Southwestern Metropolis*. Native Americans in Phoenix are more specifically addressed in Trennert's (1993) essay, "Phoenix and the Indians, 1867-1930."

ARCHAEOLOGICAL RESOURCES OF THE CITY OF PHOENIX

As recounted in the previous section, the lands within the city of Phoenix have been routinely and often intensively occupied by human populations for more than 4,000 years. Despite modern development, the presence of these past inhabitants is still expressed today in hundreds of archaeological sites located across the city. Most of these sites can be attributed to the Hohokam, but also include Archaic period sites, potentially Protohistoric Yavapai and O'odham sites and Historic period settlements, notably the original Phoenix townsite, AZ T:12:42(ASM), among others. This section provides more specific discussion of some of the resources that may be encountered during monitoring, organized in three general groups: prehistoric canals, prehistoric sites, and historic sites and canals.

Prehistoric Canals

Among the most significant achievements of the Hohokam were the extensive systems of irrigation canals they constructed in the lower Salt River Valley (Figure 4). These systems are acknowledged to compose one of the largest sets of prehistoric canal irrigation networks in the pre-Columbian Americas, and more than half are contained within the limits of the city of Phoenix (see Figure 4). Much of what is known about Hohokam canals presently derives from studies conducted in the Phoenix area. A synopsis of this research is provided below, focusing first on past mapping efforts and then data recovery investigations.

The Hohokam canals in the valley have been the subject of attention since the first incursions of American settlers into the region (Bandelier 1892; Hodge 1893; Patrick 1903; Rusling 1874). While Patrick (1903) and others (see Haury 1945) created maps of prehistoric canal alignments in the valley as early as the 1880s, it was Dr. Omar A. Turney, Phoenix's first civil engineer, who produced the most comprehensive study of prehistoric irrigation canals in the Salt River Valley (Turney 1929). He brought what had been documented by settlers, historians, surveyors, and other canal enthusiasts together with his own extensive knowledge to define, describe, and map 14 prehistoric canal systems within the valley (Figure 5).

Turney was assisted in this effort by Frank Midvale, an avocational archaeologist who later produced his own sets of maps of irrigation systems in the valley (see Midvale 1945, 1968). In addition to number-

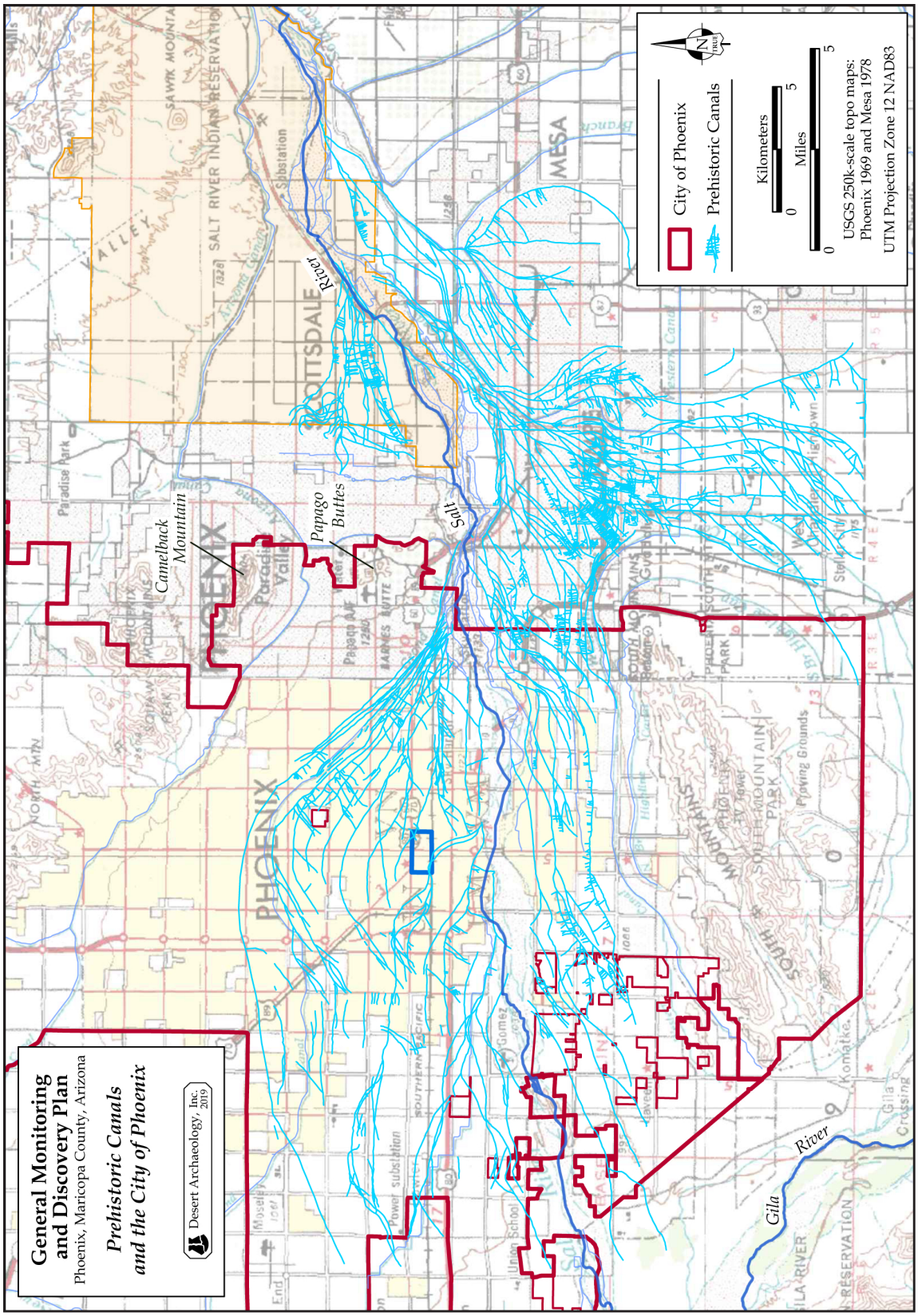

Figure 4. Prehistoric Hohokam canals in the lower Salt River Valley, reproduced from the digitized Central Phoenix Basin Archaeology Map (Howard and Huckleberry 1991b).

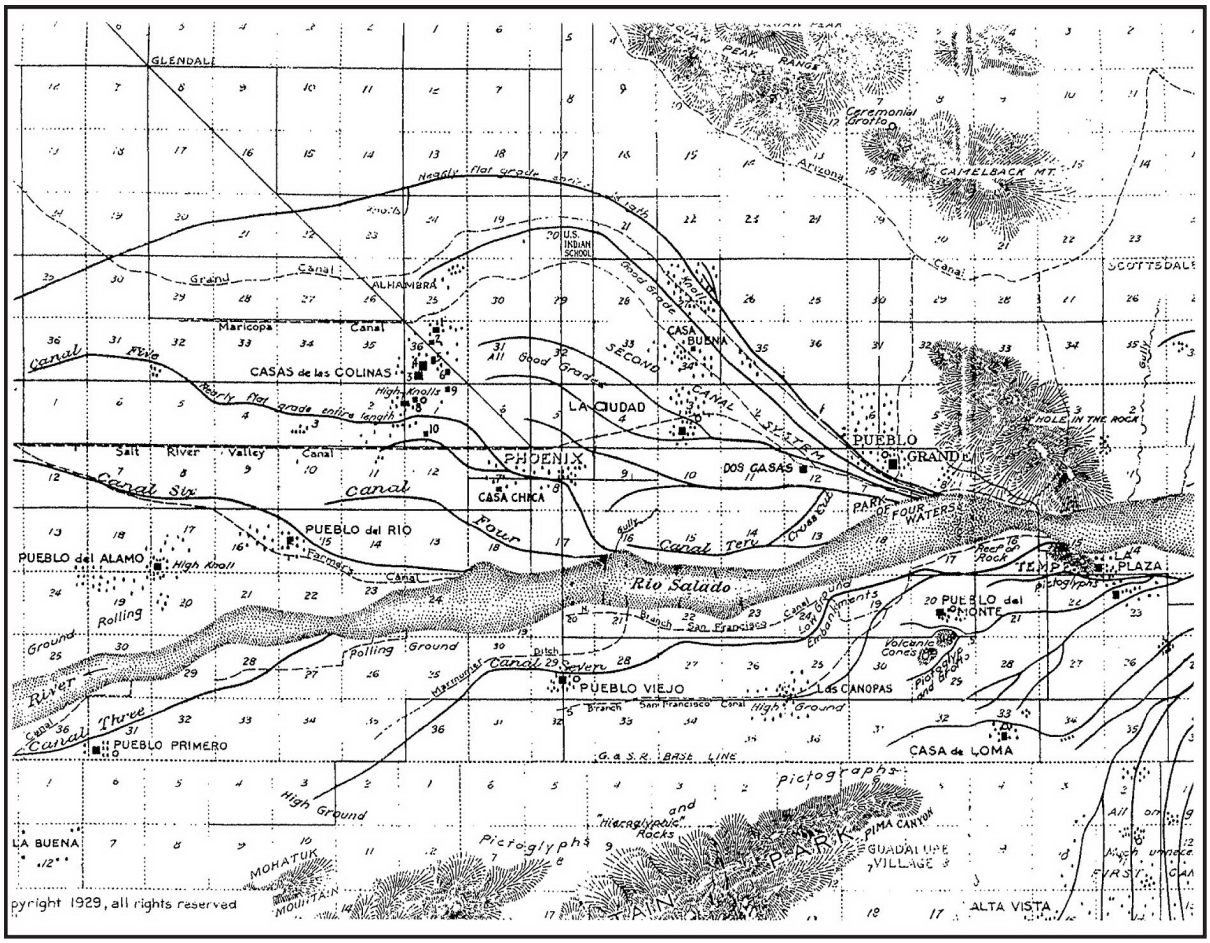

Figure 5. Reproduction of Turney's 1929 map, showing prehistoric irrigation canals and villages in the Phoenix area.

ing the canal systems, Turney (1929:48) named the area immediately south of Pueblo Grande the "Park of Four Waters" due to the one-time presence there of four primary main canals that fed Canal System 2. This system, which spans the breadth of Phoenix on the north side of the river, is arguably the largest and most complex of Hohokam canal systems in the valley.

Throughout his study, Turney (1929) marveled at the sophisticated engineering the Hohokam brought to the construction of their canals. In relation to then-extant historic canals in the valley, he observed that "the work of the ancient engineers could not be improved upon," and "in no case has it been found feasible to divert water at any point which they [the ancient Hohokam] had not utilized" (Turney 1929:51). He also recognized that it was the ancient irrigation systems that allowed the Hohokam to flourish in the valley.

In the late 1980s, Howard (1991b) undertook the creation of a new map of Hohokam canals and habitation sites in the valley as part of a larger study of Canal System 2 conducted by Soil Systems, Inc. (SSI) (see Howard and Huckleberry 1991a). Howard (1991b) used the maps prepared by Turney (1929) and Nicholas (1981), who added considerable detail to Turney's map using historical aerial photographs (see Rice 1987:Figure 2.2), as the base for his canal mapping venture. Each of these maps was enlarged to the 1:24,000 scale for tracing onto overlays of USGS 7.5-minute topographic maps (Howard 1991b:2.17). Howard added new details to the overlays, especially site names and boundaries, gathered from excavation reports, various institutions' site files, other historical maps and sources, and the same set of aerial photographs used by Nicholas (1981). Once all was drawn, SSI had the overlays digitized

by Geo-Map, Inc. of Tucson to create the compiled "Central Phoenix Basin Archaeology Map" (Howard and Huckleberry 1991b) (see Figure 4). This map and digital versions thereof are now among the first that present-day archaeologists and cultural resource managers will consult to determine what types of archaeological resources might be present in a valley project.

The first systematic excavation of Hohokam canals in the Phoenix area was conducted in 1959. As part of a larger study of Hohokam irrigation (Woodbury 1961), Woodbury (1960) investigated the two large surviving canals in the Park of Four Waters, referred to as North and South. His investigations involved the use of a long, deep trench oriented perpendicular to the canal alignment(s) to provide cross sections capable of accurately displaying the size and configuration of the channels. In addition to canal size and morphology, Woodbury (1960, 1961) utilized stratigraphic data, pollen analysis, and diagnostic ceramics to inform on dates of construction and abandonment, stages of use, and maintenance of the canals. His analyses suggested the two Park of Four Waters canals dated to the Classic period and contained sediments that reflected regular cleaning but no dramatic flooding events. Overall, this project demonstrated the skilled engineering behind Hohokam canal construction, as well as the central role of irrigation in Hohokam society.

ASM's data recovery excavations in the early 1970s for the Hohokam Expressway, led by Masse (1976; see also Bradley 1999), built and expanded upon Woodbury's (1960, 1961) work. Two sites that extended along the western side of the Park of Four Waters and larger Pueblo Grande Museum and Archaeological Park were investigated: AZ U:9:2(ASM), which encompassed the highway corridor south of the Union Pacific Railroad, and AZ U:9:28(ASM), located north of the railroad. In all, 11 Hohokam canals and a portion of the historical Joint Head Canal were identified within AZ U:9:2(ASM), and seven Hohokam canals were recorded at AZ U:9:28(ASM); small segments of 14 of these canals were excavated. Two of the canals in AZ U:9:2(ASM) were continuations of Woodbury's (1960) North and South Canals. Between these two, a third massive canal was identified, named the Hagenstad Canal.

In addition to introducing or further developing a variety of specialized canal analyses (pollen, soil particle-size, etc.), the Hohokam Expressway project yielded unexpected results. First, far more canals were found than anticipated based on surface evidence. Second, Masse (1976) expected to find pithouses or other forms of residential activity west of Pueblo Grande; instead, the area was dominated by canals. Third, although Woodbury (1960) observed only one channel each in the North and South Canals, Masse's (1976) examination revealed distinct upper and lower channels in both. The presence of these channels demonstrated that a single trench excavated through a canal would not necessarily reveal its full history—cultural activities, such as construction, cleaning, and remodeling or reconstruction, could combine to create discontinuities in the profile of a canal along its course.

The Hohokam Expressway project marks the beginning of large-scale data recovery projects in the Phoenix area spurred by implementation of the National Historic Preservation Act of 1960. More than a dozen large-scale archaeological projects were conducted in advance of new highway constructions and improvements at Sky Harbor Airport in the 1980s and early 1990s. Although most of these projects focused on Hohokam village sites, Hohokam canals were routinely encountered and investigated.

Especially notable research stemming from the canal-related investigations include the following: (1) Nials and Gregory (1989), an exploration of the physical and functional characteristics and necessary requirements for successful irrigation systems in the pre-modern age, including descriptions of anticipated physical components of Hohokam canal systems; (2) Nials et al. (1989), a dendrohydrological reconstruction of lower Salt River streamflow with implications for canal system management and even destruction, later updated using additional data in Graybill et al. (2006); and (3) Howard (1991a, 1993), a reconstruction of the growth, operation, and hydraulic capacity of Canal System 2, drawing upon the results from SSI's work along the East Papago Freeway and Squaw Peak Parkway (see Howard and Huckleberry 1991), as well as many of the other data recovery projects conducted during the same interval.

Finally, geoarchaeology, which combines geomorphological, hydrological, and pedological observations, became an important component of canal studies during this time. Huckleberry (1991) provides a useful overview of terms and methods in addition to a synthetic analysis of System 2 canals from the geoarchaeological perspective.

Canals were not distinguished from other cultural features by site in the 1980s–1990s data recovery projects. As a result, relatively few canals or canal systems within the city have been provided individual ASM site numbers. These sites include AZ U:9:2(ASM) and AZ U:9:28(ASM), discussed in part above, and AZ T:12:131(ASM) (Canal Patricio System) and AZ T:12:389(ASM) (Canal Salado System). Archaeological investigations of AZ T:12:131(ASM) and AZ T:12:389(ASM) are briefly summarized below. The section then concludes with a discussion of recent investigations of AZ U:9:2(ASM) and AZ U:9:28(ASM), which have yielded new discoveries and important insights about Hohokam canal irrigation near the head of Canal System 2.

AZ T:12:131(ASM) consists of a network of main, distribution, and lateral canals that cross the northern half of Sky Harbor Airport and extend into neighborhoods to the west. The system's primary canal corresponds with the southernmost System 2 canal mapped by Turney (1929) and later named "Patrick" and "Patricio" by Midvale (1968; see also Wilcox 1994). Canals of the Patricio System were first documented as part of the Phoenix Sky Harbor Center project conducted by SWCA, Inc. within AZ T:12:62(ASM) (Dutch Canal Ruin) (Greenwald, ed. 1994; Greenwald et al. 1995), and later by Desert Archaeology during the Sky Harbor Airport North Runway Expansion project (Henderson, ed. 2003, 2004). The latter project determined that Canal Patricio is among the longest-lived of Hohokam canals, with use extending from the early Pioneer period (circa AD 300–400) to the late Classic period (AD 1300–1500) (Henderson and Clark 2004; Nials and Henderson 2004).

Additional elements of this system have since been documented by the Sky Harbor Airport Center Runway Reconstruction project (Phillips and Droz 2007), as well as in a AZ T:12:62(ASM) (Dutch Canal Ruin) site boundary testing project that led to data recovery study of the Barranca Canal (Huckleberry et al. 2014), a distribution main off Canal Patricio and during archaeological monitoring for the Sky Harbor Airport Community Noise Reduction Program (CNRP) in neighborhoods west of the airport (Henderson and Darby 2016, 2017). Interestingly, inspection of historic aerial photographs, available online through the Maricopa County website, prior to field monitoring of subject CNRP parcels led to the discovery of new Canal Patricio System alignments.

AZ T:12:389(ASM) consists of a network of main, distribution, and lateral canals that cross the southern half of Sky Harbor Airport. The primary canal of this system is labeled "Canal Ten" in Turney's 1929 map, later named "Canal Salado" by Midvale (1968). Segments of the Salado System were studied as part of the Phoenix Sky Harbor Center project within AZ T:12:47(ASM) (Pueblo Salado) (Greenwald, ed. 1994; Greenwald et al. 1995), Pueblo Salado Areas 6, 15, and 16 testing and data recovery (Greenwald 1994; Greenwald, Ballagh, and Zyniecki 1996; Greenwald, Ballagh, Mitchell, and Anduze 1996), and an investigation involving runway improvements in the vicinity of Cutter Aviation toward the eastern end of the airport (Greenwald and Zyniecki 1993). All were then assigned feature numbers under the Pueblo Salado site number.

The Canal Salado System was designated a separate site, AZ T:12:389(ASM), during Desert Archaeology's CNRP project (Henderson and Darby 2016, 2017). Although this project included testing and data recovery efforts in residential parcels scattered throughout the CNRP project area, Salado System canals were only encountered during archaeological monitoring of parcel demolitions. In all cases, the canals were documented solely from exposures in utility line trenches, with no subsequent data recovery study. However, the location of the documented exposures were in line with the previously mapped Canal Salado. It was evident from variations in their location, size, and trajectory that the various identified canals represented branches, laterals, and realignments of a network of canals related to the main Canal Salado. Recognizing that the various segments previously recorded during SWCA's investigations within Pueblo Salado were part of the larger Canal Salado System, these were included in the overall site shape for AZ T:12:389(ASM).

Approximately 30 years after ASM's Hohokam Expressway investigations, the Park of Four Waters sites, AZ U:9:2(ASM) and AZ U:9:28(ASM), were revisited in two projects conducted by Desert Archaeology. The first of these projects involved archaeological data recovery efforts within the PHX Sky Train 44th Street Station (Henderson 2015), located immediately west of 44th Street and the earlier Hohokam Expressway project corridor. The investigations revealed an agricultural landscape crossed by Hohokam canals of varying size and purpose—many of them extensions of the Hohokam Expressway canals, the traces of irrigated fields, canal-side basins and reservoirs, and several habitation areas used by the local farmers of the area. The irrigated fields were among the most significant finds, with all elements of the field systems being exposed in plan and profile, the first ever seen within the Phoenix area. The results of this project especially revealed the Hohokam's intimate knowledge of their landscape and how to manipulate it to best advantage. The findings further highlighted why study of the irrigated spaces between prehistoric settlements is crucial to fully understanding how the Hohokam managed to thrive for so many centuries in their desert environment.

The second Desert Archaeology project was conducted in advance of the expansion of the airport employees parking lot into the Former Southwest Cooperative property west of the 44th Street Station (Henderson 2019). This data recovery effort documented 17 prehistoric canals, including major trunk canals and large and small distribution canals, as well as a new locus of prehistoric agricultural activity, AZ U:9:310(ASM). Unforeseen complexity among the canals included the surprise finding of junction areas between the two largest trunk canals and equally large distribution branches. An even greater surprise was the discovery of a low dam and spillway—a side channel weir—between the largest trunk canal and its distribution branch. This feature is currently unique among Hohokam irrigation structures; its occurrence indicates even greater engineering sophistication among the Hohokam than was previously known.

Adding further complexity to the canal landscape was evidence that portions of the Former Southwest Cooperative project area had been inundated by overbank Salt River floods. Three separate floods were distinguished, each of which led to the abandonment of a major canal. In sum, results from this second project were substantive, providing new insight about the sophistication of Hohokam canal engineering, the timing of environmental events that resulted in canal constructions and abandonments, the overall history of Canal System 2, and potentially the reason for its abandonment in the waning century of the Hohokam occupation.

There is no doubt that the vast prehistoric irrigation systems of the Salt River Valley and Phoenix Basin at large provided the infrastructure upon which the Hohokam culture was built. More complete understanding of the canals comprising these irrigation systems adds incrementally to understanding the Hohokam as a cultural group, especially regarding their unique and long-lived existence within the valley. This is the basis for the concern with identifying canals during construction projects, so these can be more effectively tracked across the landscape and their essential individual attributes documented for future research.

Prehistoric Sites

There are hundreds of prehistoric archaeological sites within the city of Phoenix, most of which are Hohokam in origin. While Archaic and Protohistoric period sites tend to be relatively simple in composition, consisting primarily of buried pits, tool caches, and scattered artifacts, there is a great variety among Hohokam site types within the valley. Archaeologists charged with monitoring at Hohokam sites should be aware of this variety to better understand the context or significance of any finds they encounter during fieldwork. For example, four Hohokam habitation site types are recognized—villages, hamlets, farmsteads, and fieldhouses—distinguished by population size, permanence and duration of occupation, and the inferred range of functions served by the settlement (Cable and Mitchell 1988; Crown 1983; Gregory 1991).

Villages, which include primary and secondary types, were the largest and most densely populated Hohokam habitation sites. They contained public facilities (plazas, ballcourts, platform mounds) and were occupied permanently for centuries by multiples of household groups. All villages were internally structured with distinct residential areas, cemeteries, roasting areas, and trash mounds, often further subdivided into village segments (Henderson 1987; Howard 1990). Secondary villages are distinguished primarily by their smaller size and the presence of a single public facility, typically a ballcourt. The earliest villages in the valley were primary villages, all associated with at least one primary main canal that had been brought onto the upper terrace above the floodplain. Examples of primary villages within Canal System 2 include La Ciudad and Pueblo Grande; AZ U:9:67(ASM) (La Lomita) is an example of a secondary village.

Hamlets were also permanently occupied sites, although duration was on the order of decades rather than centuries. This site type is typically characterized by a small number of household groups with an associated cemetery and midden area(s). Reconstructions of the growth of some villages suggest these originated from hamlet-sized units. In other cases, hamlets never developed into a higher order entity, such as at AZ U:9:66(ASM) (La Lomita Pequeña) and AZ T:12:49(ASM) (El Caserio).

Farmsteads and fieldhouse sites are the most impermanent of habitation sites. Farmsteads were relatively small sites established by a single social group primarily for the purpose of agriculture and related subsistence pursuits. These sites may have been occupied year-round, but it was probably less than a decade before the occupants moved to another location.

Fieldhouses are recognized as seasonal, temporary houses used primarily to tend to irrigated fields during the agricultural cycle. These modest sites have since been determined to be the farm sites of village-based households (Henderson 2003, 2010). Farmsteads and fieldhouses are more likely to be found in the irrigated spaces between larger habitation sites, outside of presently bounded sites. Thus, they might only be encountered while monitoring for prehistoric canals or as a discovery during unmonitored construction activity.

Other types of prehistoric sites are found within the city of Phoenix—such as quarries, shrines, trails, petroglyphs, and wild resource procurement and/or processing sites—however, emphasis is placed here on Hohokam habitation sites, as these are the most likely to have been recognized and designated an archaeological site.

Historic Sites and Canals

Historical Phoenix is contained within a relatively small area that includes AZ T:12:42(ASM), the Original Phoenix Townsite; the earliest additions to the townsite, such as Neahr's Addition (1880), the Capital Addition (1882), the Dennis Addition (1883), Linville's Addition (1884), and AZ T:12:43(ASM) (Murphy's Addition) (1884) (Woodward Architectural Group 1991); and the locations of the late 1860s homesteads that comprised the "Phoenix" settlement east of the townsite (see Henderson and Thiel 2016:Table 1.7). Not all these locations have been individually identified as historic sites, with some historical features outside the townsite being documented as part of prehistoric site investigations, notably those involving Pueblo Patricio.

Historic archaeological investigations in and around the townsite include, but are not limited to, work conducted for various Central Phoenix Redevelopment projects (Cable, Henry, and Doyel 1982, 1983, 1984; Cable, Hoffman, Doyel, and Ritz 1985); those for the Heritage Square, Cityscape, and Phoenix Convention Center projects (Hackbarth 1995, 2010, 2012); the second Chinatown (Rogge et al. 1992); Bank One Ballpark (Jackman et al. 1999); and the Phoenix Federal Building and Courthouse (Thiel 1998). Collectively, these projects provide a picture of a vibrant young city notable for its variety of governmental, commercial, business, and religious venues, as well as a multiethnic, albeit somewhat segregated, populace that resided in a range of dwelling types. More recently, historic archaeology

studies for the CNRP project (Henderson 2016; Henderson and Thiel 2016) have expanded the picture of life "south of the tracks" in residential neighborhoods east of the townsite.

Like the Hohokam, the city of Phoenix owes its existence to historic irrigation canals, a relationship described fully in the historical literature (see "Cultural Context" above). In contrast, archaeological interest in Phoenix's historic canals focuses more specifically on the earliest of the historic canals (1867–1911), when these were still farmer-owned earthen ditches with rock and brush weirs directing river water into the channels. These early canals provide useful analogs for understanding the operation and management of similarly constructed Hohokam canals. However, most of the data regarding these early canals has been obtained from historical records (see Nials and Gregory 1989) rather than in-field archaeological observation. Examples of the latter include the original Hohokam Expressway project (Masse 1976), the East Papago Freeway project (Huckleberry 1998), the Pueblo Grande/Hohokam Expressway project (Birnie 1994), and Cable and Doyel's (1986) investigation of the historic Swilling Ditch inside Sky Harbor Airport.

Between 1903 and 1911, all the historic canals in the Salt River Valley were deeded to the U.S. Bureau of Reclamation (Reclamation) and consolidated into a single integrated system managed by the Salt River Project (SRP). In the 1990s, Reclamation recommended that the entire SRP system of canals was eligible for inclusion in the National Register. A programmatic agreement among Reclamation, SRP, SHPO, and the Advisory Council on Historic Preservation regarding historic preservation treatment has been in effect since February 2001 in response to Reclamation's determination that modification and system upgrades to the SRP canals, laterals, and associated facilities would have continued effect on the system. Historic American Engineering Records (HAER) have been completed for all the main components of the SRP system as part of Reclamation's multiple property submission for the *Salt River Project Diversion and Conveyance System Historic District*, listed in 2017 (Reference #100001454).

RESEARCH DESIGN

While the overall goal of any archaeological investigation is to gather data that informs on the prehistoric or historic past, the scale of ground disturbance associated with most archaeological monitoring projects precludes an ability to address research themes of broad anthropological or historical relevance. Further, all city-directed archaeological monitoring occurs in the context of construction or utility improvements projects that lie inside the boundary of a known archaeological site, or inside the 250-ft-wide site-sensitive buffer of a known archaeological site, or within 50 ft of a mapped prehistoric canal. Monitoring is not used as a site discovery tool, but rather, to gather information about an existing site or canal. Therefore, this research design provides a basic set of research questions that could realistically be addressed through monitoring results.

Archaeological Sites

What is the age of the cultural items observed during monitoring? Does the age of the cultural finds conform to current understanding of the age of the site? What activities are indicated by the cultural finds? What might the identified features/materials indicate about the larger site being monitored? What is the relationship of the cultural finds to the current site boundary or known distributions of site features?

Research topics to which answers to these questions may contribute include: (1) site chronology, the sequencing of events at a site, such as when materials in the site were deposited, the duration or longevity of a feature or locus, and when portions of the site were abandoned; (2) site or locus function, types of activities that were accomplished at the site; (3) site structure, the arrangement of residential units, extramural activity areas, trash disposal areas, and special-use areas across the site; (4) settlement pattern, the distribution of sites by time and type across the natural landscape; (5) subsistence and land

use practices, types of subsistence products and methods of their exploitation, including techniques used to modify the natural environment to enhance exploitable products; and (6) ritual and ideology, as might be expressed in mortuary practices, which provides insights into both the beliefs and the organizational principles of past societies, as well as symbology expressed in material objects such as petroglyphs or purposely shaped objects and on painted pottery and other decorated artifacts.

It is not anticipated that all these topics could be appropriately addressed from monitoring results, but they provide additional research directions in those situations where limited feature excavations are appropriate. If there is a need to undertake limited data recovery, more in-depth research questions would need to be provided in the amended scope for the additional fieldwork.

Canals

What is the size and possible age of the canal? What does the size and internal stratigraphy of the canal indicate about water flow and capacity? Are there indications of clean-out events, repairs, or disruptions to water flow? Did the canal occur where anticipated? If not, can the identified canal be related to any known nearby irrigation system?

Research topics to which answers to these questions could contribute include irrigation system chronology, structure, operation, and management.

WORK PLAN

The primary objective of an archaeological monitoring project is to document any cultural features or materials exposed during construction or demolition activities. The larger purpose is to preserve information about cultural materials that might otherwise be destroyed. Careful recording of archaeological features and collections of artifacts observed during monitoring, with consequent analysis and consideration of collected materials relative to research questions posed in the preceding section, contribute to the goal of increasing current understanding of the prehistoric or historic past. Procedures and methods to accomplish these objectives are presented here.

Preparation

For all archaeological monitoring on city land inside an ASM-designated site boundary covered in this plan, archaeological consultants/contractors are required to obtain an Arizona Antiquities Act Project Specific Permit (AAA permit) from the ASM, enter into a repository agreement with the Pueblo Grande Museum (PGM), and obtain a burial discovery agreement from the ASM before beginning the archaeological project. At the discretion of the CAO, the consultant may choose to use the city's blanket burial agreement for city-sponsored projects conducted under this plan.

For AAA permit and burial agreement applications, this document serves as the general archaeological monitoring plan. To obtain an AAA permit under this plan, ASM requests submission of a "Permit Application Addendum: Work Conducted Under a General Work Plan" form and a map depicting the project area and affected site(s) on a USGS base map at 1:24,000 scale, neither reduced nor enlarged.

Archaeological monitoring outside of an ASM-designated site boundary or within the city's 250-ft-wide site sensitive buffer does not require an AAA permit. However, if subsurface archaeological deposits sufficient to warrant site designation or inclusion into an existing archaeological site are identified while monitoring outside an ASM-designated site boundary, an AAA permit, a PGM repository agreement, and, if appropriate, a burial discovery agreement must be acquired by the archaeological consultant/contractor.

Prior to fieldwork, archaeological records held by the CAO and the ASM Archaeological Records Office and provided in the statewide archaeological database, AZSITE, should be consulted for information about previous cultural resources projects and known archaeological sites that occur within either a 0.5-mile distance of a city or private monitoring project, a 0.5-mile distance for federal projects located in a highly urbanized area, or a 1-mile distance for federal projects outside highly urbanized areas. The CAO prefers the term "project area" be used to describe the area to be monitored for city and private projects; projects with a federal nexus must use "area of potential effects" (APE) for this purpose. In addition to the records search, consultants are advised to also consult historical maps and aerials of the project area/APE in advance of fieldwork, as well as the archaeological literature pertaining to the site or canal to be monitored.

The CAO has specific protocols for sharing archaeological data. The office requires a confidentiality and security statement be signed by city department staff or their consultants/contractors prior to sharing any site sensitive data. These data include site information, data tables, and GIS shape files and map layers. The CAO can provide guidance regarding data sharing to the archaeological consultant prior to beginning fieldwork.

The city also has specific media policies for burial discovery situations. Native American communities in Arizona have stated that the public should not be allowed to view human remains during their excavation and that photographs or video film of said excavations are strictly prohibited. The area containing human remains must be secured with shaded fence; any cloth placed on the burial itself must be muslin cloth. Archaeological crew members should not post photographs or locational information on social media about projects yielding or that may yield human burials.

If news media or curious bystanders come onto the site where human remains are being removed, they should be referred to the CAO. In no circumstance should the media or individuals be informed that human remains have been found. According to the Arizona Public Records Act (ARS §39-125), the City of Phoenix can refuse to provide information to the public about the location of human burials to protect them from vandalism.

General Field Procedures

A great variety exists in the sources of ground disturbance that occurs during construction and utility improvements projects. These sources may include the use of mechanical augers, narrow-bucket backhoes, and vacuum excavators to excavate small exposures such as postholes, geotechnical test holes, and utility line locates; backhoes or trackhoes with variously sized buckets to excavate trenches; and belly scrapers to remove soil for reprocessing from and for building pads. In some cases, such as installations of electrical conduit, waterlines, and storm drains, the fill removed from a trench will be immediately deposited into a dump truck for disposal or reprocessing off-site. Fortunately, sediments can be readily observed as they are scooped and removed by the backhoe or trackhoe, so excavation can be stopped if artifacts or other evidence is seen to suggest the presence of an archaeological deposit.

Ground disturbing activities related to building demolitions usually include the removal of concrete slabs, foundations and footers, surface pavements, trees, and brush, as well as removal of all underground utilities, including electric, gas, water, and sewer lines, cesspools, septic tanks, and so forth. The equipment of choice is a backhoe or trackhoe; utility lines are typically chased using smaller 2-ft-wide buckets.

In some cases, the CAO may request pre-construction test trenching, in which trenches are excavated prior to construction but in the same location as proposed construction excavations. This approach is appropriate when there is moderate potential for encountering sensitive cultural resources and where previous disturbance is minimal. The purpose of pre-trenching is to determine if significant cultural

resources are present prior to construction so that limited data recovery or avoidance can be achieved without halting the construction project or resulting in significant project delays.

Regardless of the ground disturbance type, the procedures for archaeological monitoring are essentially the same. The archaeology team should coordinate at the outset with the construction contractor's team and city inspectors to identify the work schedule and responsible individuals. The designated monitor should be equipped (for example, hard hats, steel-toed boots, safety vests, safety glasses, etc.) to meet the safety standards of the city and construction crews and to appropriately record identified archaeological resources. The CAO advises that the archaeological monitor's tool kit should include a length of muslin and other appropriate supplies to protect and shield burials from view if these are discovered while monitoring.

Thereafter, a qualified archaeologist[3] will be present at all times to monitor a project's ground disturbing activities. The archaeologist will inspect all excavated exposures and spoils removed for evidence of cultural materials (for example, ceramic sherds, flaked stone, ash or charcoal-stained areas). Sidewalls of excavations will be scraped by hand to expose a clear cross section to enhance recognition of buried features.

If an archaeological feature is located, the monitor may temporarily halt excavation so the feature can be documented in profile or in plan and sampled for pollen, botanical material, or diagnostic artifacts if appropriate. If human remains are encountered, all work will be discontinued within 15 m (50 ft) of the remains and the area secured until notifications can be made and appropriate documentation and recovery can be completed (see Burial Treatment below).

The monitor will keep a daily log documenting the location(s) monitored, the city inspector on duty, the time spent monitoring, dimensions and depth of disturbances, sediment types and stratigraphy observed, whether artifacts or other cultural resources were present, and the measures taken in that event. Some city departments require the daily log be signed (daily) by the construction inspector.

All archaeological features encountered during the work will be recorded. The archaeologist should document their presence through mapping, profile drawings, photography (except human remains, see below), and written descriptions. The location of features and any collected artifacts will be recorded on construction plan maps and plotted using a GPS or similar device, and standard feature description forms will be completed. The locations of all construction exposures will also be mapped and GPS plotted.

If archaeological features are identified whose further study could contribute new or important information about the site being monitored, additional effort such as limited excavation may be necessary. The decision to pursue limited data recovery excavations will be determined through consultation with the CAO and other agencies as applicable (see "Limited Feature Excavation"). If this general monitoring and discovery plan is being used for a federal undertaking, the work would need to stop to allow consultation with the SHPO pursuant to the NHPA on a finding of Adverse Effect and development of a Memorandum of Agreement (MOA). The federal agency would take the lead in these consultations; work could not begin until an MOA is in place.

Discoveries

Discoveries are defined as the inadvertent identification of archaeological deposits during construction activity outside of site boundaries where archaeological monitoring was not required. Discoveries

[3]The CAO defines "qualified archaeologist" as members of an Arizona Antiquities Act-qualified firm or organization whose staff archaeologists meet the Secretary of the Interior's Professional Qualification Standards (Appendix A, 36 CFR Part 61).

must be reported to the CAO and the ASM by the construction contractor. After notification, recording by an archaeological consultant would follow the procedures described above, except in the case of human remains, which would be treated as described below.

Burial Treatment

Human burials may be encountered during any phase of archaeological investigations within a prehistoric site. Therefore, the archaeological monitor is required to read the project burial discovery agreement prior to fieldwork and to keep a copy of said agreement in the field. This agreement must also be read by any archaeological personnel who might assist in the recovery of human remains.

If human remains are identified, work will be discontinued within a 15-m (50-ft) distance of the remains and the City Archaeologist immediately notified, followed by notifications to the ASM and tribal representatives as specified in the project burial discovery agreement. The area of disturbance will be secured by shaded fencing, any exposed remains covered with plain cotton muslin, and no further work will be done until tribal representatives have had an opportunity to hold traditional observances at the location of the remains. Only then will recovery and recording of the burial begin.

All burial remains will be excavated and documented with professionalism and respect in accordance with the project burial discovery agreement. If remains are disturbed at the time encountered, they will be secured in such a manner as to protect them from further damage and keep them from public viewing until proper authorities are notified. The presence of human remains will not be discussed, and the general public and media will be restricted from the area of their disturbance.

The exhumation of burial remains will be conducted in a controlled, respectful manner. Prior to beginning excavations, a security fence with cloth-covered panels will be erected around the perimeter of the excavation area. The remains will be hand-excavated by a qualified archaeologist trained and experienced in human osteology and/or by an osteologist. All fill above the remains will be screened through ¼-inch mesh. Once human (or animal burial) remains or burial coverings are encountered, all fill will be screened through ⅛-inch mesh. If very small bone fragments or tissue remains are present, they will be collected in soil matrix. If burial coverings are present, they will be mapped, described, and collected as part of the burial. The exposed burial will be documented using written descriptions, maps, and GPS plotting.

The archaeologist will describe all aspects of the excavation and findings in written notes, draw a plan view map for each burial showing the remains and all associated funerary objects, and draw a cross section of the burial feature. A qualified osteologist will examine the human remains prior to their removal from the grave, in accordance with the established burial discovery agreement. No photographs will be taken of the remains or individual and associated funerary objects.

The burial remains will be documented using only non-destructive techniques. Human bone will not be cleaned other than by dry brushing (if necessary) with a soft-bristled toothbrush, and there will be minimal to no contact with human remains by personnel other than the project osteologist. Ceramics will be cleaned (if necessary) with a damp cloth only. Funerary vessels and objects will not be washed for any reason, although dry brushing of funerary vessels and objects is allowed. Vessel contents will not be removed. Fragile material, such as animal bone, shell, and minerals, will be dry brushed as needed. No labels will be attached to any artifacts, and all will be returned to their original paper bags fastened by cotton string or paper tape. Skeletal remains will be wrapped in cotton muslin.

The exhumed remains will be examined in a laboratory by a trained osteologist to verify the information collected in the field and to make additional observations. The remains will be examined to determine the possible age and sex of each individual and to assess their state of skeletal and dental health at death. Data will be recorded on condition, size, degree of fragmentation, degree of incineration

(if burned), other taphonomic processes, pathological and genetic abnormalities, and basic information about the age of the individual at the time of death. Standard osteological techniques will be used in making these determinations, utilizing basic data recording procedures and forms established by Buikstra and Ubelaker (1994) and the ASM.

Estimated age at death will follow procedures described by Buikstra and Ubelaker (1994). Age categories include the following: fetus (pre-birth), infant (birth–2 years), child (2–12 years), juvenile (12–18 years), young adult (18–35 years), middle adult (35–50 years), and old adult (50+ years). Additional observations for the extent of root development of deciduous and permanent teeth, based on Moorees et al. (1963), and formation and eruption sequences by Ubelaker (1989) will be used to determine the age of children.

After recording, the individual will be housed in unmarked cardboard boxes and secured in a private area in Arizona until repatriation. Following documentation, the individual and associated funerary objects will be repatriated.

Limited Feature Excavation

If archaeological features are identified during monitoring, the CAO and/or applicable agency may determine that additional effort in the form of limited excavation is warranted to retrieve further information about the archaeological site in which the features were found. Expected levels of effort for feature types that might be present within the limits of an archaeological site are summarized in Table 2.

To obtain a useful sample of materials from features and to determine feature form and function, rectangular excavation units may be placed over selected features exposed during ground disturbing activities. The size of the excavation units will be determined by the type of feature and the depth of the deposit. Typically, square 1-m by 1-m or rectangular 1-m by 2-m sample units will be used. Smaller features, such as pits, which are often smaller than the 1-m by 1-m or 1-m by 2-m units, may be bisected and one-half excavated as a sample unit. These excavations should be based on observable stratigraphic levels when possible and all sediment screened through ¼-inch mesh. When natural stratigraphic breaks cannot be discerned, features may be excavated in 10- to 20-cm levels as appropriate for the context.

Artifacts and special samples (for example, flotation, pollen) will be collected for analysis, as appropriate. Excavations will be recorded on standardized forms. In addition, plan view maps will be drawn of the excavations, and photographs documenting the excavations will be taken. In most cases, it will not be necessary to suspend construction activities in other areas during these excavations.

Canals will be documented primarily through the use of detailed cross-sectional profiles. These scaled drawings should include descriptions of individual strata and sediments both inside and outside the irrigation feature. The canal profiles should be drawn to scale and recorded in concert with a geomorphologist.

Artifacts visible in the canal profile will be collected. If visible, charcoal samples will be collected for radiocarbon dating. Soil samples will be collected from each stratum within a canal for sediment textural analysis and ostracode and pollen analyses as appropriate. Samples for optically stimulated luminescence (OSL) dating may be collected from appropriate canal strata. If artifacts seem to be particularly abundant in profile, it may be appropriate to excavate a 1-m by 1-m unit to better sample the canal.

Table 2. Typical archaeological treatments for features commonly identified during monitoring.

	Feature Form	Profile Sketch or Schematic Drawing	Scaled Plan/Profile Drawing	Photograph	Diagnostic Artifacts Collection	Sample Collection[a]	Sample Unit Excavation[b]	Complete Feature Excavation
Prehistoric Features								
Non-thermal pit	X	X		X	X	X		
Pit with intentionally placed artifacts	X	X		X	X	X	X	
Thermal pit	X	X		X	X	X		
Pithouse/pit structure	X		X	X	X	X	X[c]	
Trash concentration/midden	X	X		X	X	X		
Canal/water control feature	X		X	X	X	X		
Human burial	X		X		X[d]			X[d]
Animal burial	X		X		X[d]			X[d]
Historic Features[e]								
Foundation	X		X	X	X	X	X	
Basement	X		X	X	X		X	
Non-thermal pit	X	X	X	X	X			
Bur pit/trash pit	X	X	X	X	X		X	
Privy	X	X	X	X	X	X	X	
Well	X	X	X	X	X	X	X	
Animal burial	X		X	X	X			X
Canal/water control feature	X	X	X	X	X	X		

[a]Flotation, pollen, charred material for radiocarbon dating, and/or canal sediment samples for textural analysis.
[b]Sample excavations may follow procedures set forth in this monitoring and discovery plan in consultation with the CAO.
[c]The CAO and other involved parties should be consulted to determine if sample or complete feature excavation is warranted.
[d]All human burials and prehistoric animal burials will be completely excavated and all associated artifacts collected.
[e]Archival research should be conducted to aid determination of the age and potential significance of historic features.

Artifact Analyses

Artifacts collected during the fieldwork will be returned to the laboratory, processed in accordance with PGM curation standards, and analyzed using established procedures. Processing includes washing, sorting, labeling, and boxing all artifacts and faunal remains. Currently accepted practice dictates that cleaning will be minimal to avoid potential inadvertent loss of data.

Artifact types that may be collected during monitoring include ceramics, flaked stone, ground stone, shell, animal bones, macrobotanical remains, and historical artifacts. These items will be analyzed by specialists in each of the respective artifact types. Minimally, this analysis will involve identification of all artifacts, classification to the level of accepted practice, and comparison with similar assemblages from other appropriate sites. Material for radiocarbon or OSL dating will be sent to qualified laboratories. The resulting data will be examined relative to the research questions outlined herein.

If limited feature excavations are deemed necessary, the CAO will require the archaeological consultant to prepare a scope of work that includes discussion of the analytical methods to be used for each anticipated class of artifacts. References pertaining to the chosen methods should be included in this scope of work.

Reports

Three types of reports will be generated during the monitoring project. These include the monitoring log mentioned above, weekly progress reports transmitted by email to the CAO, and a technical report that summarizes the results of the monitoring project following completion of the field effort and analysis. If human remains are identified during the project, a Report of Remains with a roster and documentation of the remains will be completed and submitted to the Repatriations Office at ASM and the claimant tribe.

The technical report will include the following: (1) discussions of the purpose and background of the project; (2) environmental context and culture history for the project; (3) previous archaeological research pertaining to the project; (4) relevant research questions from the research design presented herein; (5) descriptions of the methods and results of field tasks; (6) detailed descriptions of all features identified and artifacts recovered; and (7) an interpretive discussion of the project results and data analyses that addresses the identified research questions. The report will include professional quality maps and photographs showing the location and setting of the project area, archaeological features, profile and plan drawings, and artifact illustrations and photographs as needed. The report will include a map showing the project area and archaeological sites plotted on 1:24,000 scale USGS 7.5-minute topographic maps, a previous projects maps also depicted on a USGS topographic map, and aerial photographs showing locations of monitored ground disturbance and finds.

A draft of the report will be submitted for review to the CAO, ASM, SHPO, and others agencies, as applicable. Reviewer comments will be addressed in the final technical report.

Curation

With the exception of any materials that will be repatriated to affiliated groups, all project materials and documentation will be submitted to the PGM following acceptance of the final report. The materials to be curated include artifacts, processed non-artifact samples, original field notes, maps, analysis records, photographs, and hard and digital report copies, following PGM curation standards. Any spatial data produced during the project will be submitted within a GIS that utilizes ESRI File Geo-

Database format. At a minimum, these data will include the bounded project area location. Identified feature locations or boundaries and areas of archaeological investigations (trenches, excavation units) should also be included. A copy of the GIS data should also be supplied to the CAO.

Additional submittals include one bound copy and one digital copy of the final report, as well as GIS shapefiles of the project area to the CAO. Report copies will also be curated at ASM if the monitoring project was conducted under an AAA permit.

Repatriation of burial remains will follow CAO, PGM, ASM, and tribal protocols as specified in the project burial discovery agreement. A Report of Remains will be submitted to the Repatriation Office and claimant tribe.

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