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*A Cross-Cultural Analysis of the Policy, Application and Effect of Legislation Concerning Archaeological Sites in Reservoirs, and Implications for Future Reservoir Works and Site Monitoring*

Submitted by

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## Abstract

The number of dams and reservoirs in the world is at an all-time high, with global increases expected as water shortages, populations and needs for electricity grow. Despite this high number of existent and planned reservoirs, the archaeological sites submerged in reservoirs have been largely ignored saving predevelopment, project-specific archaeological salvage campaigns. The overlooking of submerged archaeological features derives from ideas that sites in reservoirs are destroyed: a notion that continues to permeate discussions surrounding archaeological features in reservoir flood zones. Heritage legislation, at both the domestic and international level, continues to neglect the pressing issue of monitoring the condition of submerged archaeology. This dissertation analyses the domestic heritage legislation of three specific countries (Britain, the USA and Egypt) and heritage legislation at the international level. Effects of submergence on diverse archaeological features from those countries are also taken into account via the data collected from varying types of archaeological investigation: the desk-based assessment, underwater archaeological fieldwork, and non-intrusive terrestrial fieldwork. Analysis of current legal structures suggests that mechanisms with which to monitor sites and provide mitigating measures would be simple to implement and maintain. Data collected through underwater archaeological fieldwork in Britain and terrestrial archaeological fieldwork in the USA suggests that not all types of archaeological sites are at risk of destruction due to submergence, leading to a classification of vulnerable features, determined on the basis of location in the reservoir and construction materials and methods. Mitigating and monitoring measures of these vulnerable feature classifications can be used in future reservoir planning and archaeological conservation efforts, when combined with changes to regional and domestic heritage policy. Final conclusions focus on the need to classify archaeology in reservoirs as "submerged landscapes", an already recognized underwater archaeological category, thereby helping to grant the long-needed protection, awareness and monitoring these features need throughout their duration *in situ*.

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*Our cultural and natural heritage is an irreplaceable source of life and inspiration.  
It is our legacy from the past, what we live with today, and what we pass on to future  
generations.*

-UNESCO World Heritage

## **CHAPTER 1: INTRODUCTION AND FOUNDATIONS**

The number of archaeological sites located behind dams in water impoundment areas has increased steadily over the past 75 years, subsequent to the increased human requirements for renewable energy and fresh water for irrigation and drinking purposes. Rapid and costly surveys, relocations and the long-term inundation of sites have resulted; with inundation is the more commonly undertaken course of action when an area is flooded. The post-inundation study of archaeological materials within those impoundment areas remains a lesser-examined area within the field of underwater archaeology, and few legislative actions taken in order to mitigate and manage landscapes submerged by reservoirs. Financial costs of archaeological rescue projects related to the creation of dams and reservoirs exceed the hundreds of millions of pounds, and this does not factor in the inherently high social costs related to the methods used in performing the actual rescue efforts. This provides two-fold reasons to critically examine this field. First, the financial burdens undertaken by researchers and developers to study and conserve archaeological remains soon to be inundated by reservoirs is high, and in an age when archaeological research is driven largely by tight budgets, an examination of the materials post-inundation helps to ensure that money is being thoughtfully and necessarily spent during these pre-inundation stages. Second, with plans to rescue

and record archaeological materials quickly put into place, and no current set of 'best practice' guidance available, it is obvious that there remains a notion amongst the researchers and rescue archaeologists that materials will not survive inundation in a suitably conserved and accessible manner to render hasty pre-inundation studies unnecessary. The practices undertaken in reservoir flood zones and the lack of methodological foundations in this area present the opportunity to laterally examine this issue through the following research questions:

1. How do reservoirs actually affect archaeological materials at each level of the water column within a reservoir? Does the construction material play a role in its survival or degradation?
2. Can this examination provide a means through which archaeologists and cultural resource managers can prioritize and more holistically manage sites that are flooded in the longer term?
3. How has policy at the national and international levels contributed to the current state of reservoir archaeology, and how can changes in policy result in better management and greater consultation and stewardship agreements with local populations?
4. Can a combination of underwater archaeological fieldwork, landward survey, aerial and photoreconnaissance (desk based assessment), and policy analysis provide a framework for mitigating damage of archaeological materials and sites in current and future reservoirs?

While it is unlikely that some of these sites would have received worldwide notoriety or archaeological conservation treatment if it were not for large dam construction (e.g. those monuments relocated at Philae, behind the Aswan High

Dam), the sheer quantity of sites that have been submerged, with little post-inundation investigative works or legislative protections is worrying. This is because there remains little evidence to justify the tremendous cost and effort of large-scale survey and conservation works before the reservoir has filled. In essence, it may be possible that archaeological sites endure submergence in reservoirs, and that time and specialist efforts can be better utilised when dam development plans commence, while also allowing underwater archaeologists with different survey techniques and greater periods of time to uncover the same information and with greater stewardship links with the local community. While standard practices of watch, survey and excavate before and during development continue in the UK, in other nations sites located within flood zones only occasionally receive the same treatment. There is a further and distinct asymmetry between the study of sites pre-inundation and the study of those sites and how reservoirs have affected them, post-or mid-inundation. Submerged sites have received such little attention post-inundation that policies at the national and international levels, and how they have affected archaeological sites, have little been called into question or thoroughly analyzed. This practice between archaeologists and policy legislators must now receive a degree of reconsideration, given the rate of dam construction and currently inundated sites around the world.

The first step is to identify where policies do exist and where they go wrong. This involves addressing where adequate policy could exist, what attempts have been made to address the concerns associated with development and planning, and reservoir construction in the country, and finally address the relationship between international law and how best practice guidance may be developed. As with many types of resources, our heritage resources are subject to the same political, economic

and social politicization, economization and intentional commodification. For those sites that would not likely generate income, enhance the national identity, or provide a research platform, flooding by the forming reservoir is often allowed. This happens concurrent with a full survey and relocation of those features that are most likely to generate income or identity; i.e. allowing the submergence of features of lesser national importance. The potential problem is not only the unknown information about how the site will physically change as the reservoir waters rise up over it, but how the perceptions of these archaeological sites change, and how policy decisions have influenced whether the site is moved or left *in situ*, but how these sites are surveyed and subsequently monitored, cross-culturally. There is little published information to draw upon, because it is a hereto-understudied field.

Calls to action by the UN over the past decade have included a variety of working papers, conferences, workshops and articles criticizing the construction of dams due to the loss of cultural and archaeological sites around the world, most recently addressing the losses occurring because of the Three Gorges and the Ilisu Dams (Brandt & Hassan 2000; Wangkeo 2003; Timothy 2011). Yet, cultural heritage is still actively undergoing inundation and this “incalculable loss” (Brandt & Hassan 2000, 2) is occurring at an alarming rate. Whether loss is always synonymous with inundation in a reservoir is the key examination of this thesis, but it also strikes the author as archaeological and politically unsound that policies do not exist to address the issues surrounding sites once they are in reservoirs.

Therefore, another aspect of reservoir archaeology examined in this work is the combined analysis of rescue works conducted over the past fifty years and current policies, using a cross-cultural approach to examine three case studies, in

order to shed new light and new analysis on old decisions. It addresses and reaches for an understanding of how current policies and legal structures continue to affect archaeological methodology regarding features in reservoirs and how those archaeological methodologies also have the power to shape and shift policy. Both policy writers and archaeologists are responsible for displacement of holistic understanding and engagement with many cultural sites now within reservoirs, notwithstanding the increasingly frequent calls for modification of dam development priorities. Time and again, archaeologists tackle large issues: the ethics of stewardship of archaeological sites, working with local communities in a holistic way toward managing local archaeology, and assessing sites last minute, as dam construction continues. For all of this, and all that archaeology has called upon international and local agencies for increased awareness and intervention, the discipline remains largely uninvolved in longer-term development and planning programs, and thus we are unaware of the potential resilience of archaeological features left to reservoirs.

Submergence should not preclude archaeological materials and sites from serious consideration and investigation, as well as how the reservoir itself has changed, redistributed, damaged or preserved it, and the case studies conducted in this body of work will examine the effectiveness and possibility of post-inundation study. While, to date, there have been few comprehensive studies of sites submerged in reservoirs, there are adequate formation process analyses, predictive models, and seabed theories within the field of underwater archaeology to make educated assertions about the nature of those sites and the changes they have undergone and will continue to undergo. The response to submerged archaeological materials

through the lens of national and international policy also undergoes analysis in this work, providing policy recommendations for the future management of reservoir planning and holistic archaeological response.

## **1.1 What constitutes a site?**

The sites considered for this body of work are all sites that were once terrestrial and now submerged. They are not limited to a specific period of time, construction material, typology, size or region. For sites selected, there were two nominating determinants: submerged at least partially in a reservoir for periods of each year and previous partial or full survey or excavation work. Thus, sites are considered “submerged archaeology”, that were studied to some extent prior to the filling of the reservoir. The rationale behind these two qualifying factors was that in order to know how reservoir conditions affect a site, it was useful to know in what condition that site was over the years before underwater fieldwork was conducted, and ideally, before the site was inundated. That information provided a baseline from which all deductions and analysis stemmed.

Many sites are considered “submerged archaeology”, as this definition does not hinge upon the site having been previously studied. In all likelihood, there are thousands of submerged archaeological sites in reservoirs around the world. However, throughout this work, only sites that were previously recorded are used to illustrate all points, from policy and planning, to future mitigation measures. It is not within the scope of this work to consider sites that are either outside a reservoir’s maximum fill level, or sites that are unknown, still waiting to be uncovered on or under the floor of a reservoir. Sadly, natural landscapes that may be considered the cultural heritage of a people are also excluded from this study, even if they are

submerged landscapes. In order to obtain the most from this limited range of data collection, only man-made, rather than man-utilized, sites are considered “submerged archaeology” within the context of this body of work.

In the greater field of archaeology, what constitutes a site is still a matter of some debate (Wilkinson 2003). Is an openly used space, frequented by prehistoric or historic communities, considered a site or an important landscape? Are farmers’ fields considered sites? Or are only those artefacts, structures and areas that are specifically crafted by the hand of humanity considered archaeology- and does this therefore mean that only those specified things are worth recording and preserving? This potential answer is limiting, bespeaks of a return to a colonial notion of archaeology, and is patronizing and foreign to many communities around the world if that answer considers only a western world view. UNESCO has gone so far as to provide a solid set of definitions for what constitutes a World Heritage Site:

- “A UNESCO World Heritage Site is a place (such as a forest, mountain, lake, desert, monument, building, complex, or city) that is listed by UNESCO as of special cultural or physical significance. ...
- Areas containing cultural or natural heritage of outstanding universal value may be classified as World Heritage areas
- Natural and cultural sites listed... for their exceptional features of scientific, cultural or aesthetic importance so that they can be preserved for humanity” (UNESCO World Heritage Convention 1972).



Yet, within archaeology we repeatedly struggle with concepts of “site”, just as we struggle between notions of “stewardship” and “ethics”. However, for the sake of this work, the concept of "site" was limited to those areas directly connected with human activity (i.e. deposition, construction or use) as these areas would be easier to analyse for potential rates of change due to the reservoir's influence than "site" in the broader concept of archaeological and historic landscape.

## **1.2 What is submerged archaeology?**

Submerged archaeology is underwater archaeological term for archaeological sites, features, monuments, or constructions, which were constructed by people for use on-land or terrestrially. It is a form of archaeological material that was never intended for submergence beneath the water, yet through time and/or modern development, has come to be at least partially submerged by the waters of a reservoir either through the use of a dam or other type of water impoundment. These sites and features are as unique and valuable as those studied in the fields of nautical and landscape archaeology. Submerged archaeology, also referred to in this work as submerged heritage, within the context of this body of work, is by nature settled in fresh water since it is freshwater sources that remains the focus of dams and impoundments. Sites are located in the reservoirs, rather than abutting a reservoir or impoundment, and do not include features such as fish traps or other riverine associated features that were originally associated with the body of impounded water, unless it has become submerged by the reservoir<sup>1</sup>.

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<sup>1</sup> Therefore, nothing downstream of the dam is considered a part of ‘submerged archaeology’.

Within the context of other researchers' works, submerged archaeology has other meanings. It can refer to whole towns, cemeteries, and prehistoric landscapes: all of which were submerged through tectonic activity close to shorelines or dramatic changes in sea levels. In other contexts, it can refer to the same types of landscapes, town and cemeteries, which have fallen into the ocean due to volcanic activity, series of smaller earthquakes over time, or shoreline erosion which has caused the collapse of large expanses of earth into the ocean. Submerged archaeology can even refer to archaeology within wells or caves, now submerged by springs of water that have filled the cavities that were previously empty and [predominantly] dry. Indeed, submerged archaeology in all of its forms shares many common denominators: they were all once terrestrial features now submerged in water. The difference is not whether they are submerged in water, but why they are submerged, in what type of water, and how that water affects it.

### **1.3 Why are reservoirs important study areas?**

The reservoir, with its uniquely submerged archaeological sites, presents new opportunities for discovery, education and investigation, unlike those opportunities presented through the study of maritime or nautical archaeology. Neither a "time capsule" of a shipwreck, and therefore not of concern to nautical or maritime archaeologists, nor a submerged prehistoric landscape, the reservoir is a massive landscape representing millennia of uses and containing the secrets of prehistoric landscape archaeology, as well as modern usage. Therefore, the reservoir is its own type of time capsule: one in which the prehistoric site presents itself in its spoiled and aged form alongside the modern cottage, abandoned overnight as reservoir flood waters rose up around sleeping occupants (Hardin 2010, 37). The features, now

flooded in it, are frozen not only as they were (protected from other types of development), but also as they are *in situ* at the time of flooding: they are 20th century cross sections of archaeological features as they were then.

The reservoir time capsule certainly differs from the outdated "Pompeii Premise" proposed by Schiffer and the processualists in the 1970's (Schiffer 1976) and argued against by Binford (1981). Here in a reservoir one finds that sites do not adhere to the closed-status as the result of one catastrophic and contained event. Furthermore, if one is to take anything from behavioural archaeology (Schiffer 1976; Skibo & Schiffer 2008), one finds only the reservoir: the singularly intentional act of creation, rather than a site of specific and untimely abandonment and destruction. Instead, the catastrophic event was the actual reservoir, containing an entire landscape rapidly brought to disuse by the formation of the reservoir. Reservoir time capsules are the polar opposite of the shipwreck site, in which a vessel is rapidly abandoned or lost, and instead represents an entirely new entity that has been formed in order to wholly devour and enclose any variety of archaeological features that sit in its way. In a reservoir, the archaeologist finds a site or feature with known parameters<sup>2</sup>, uses and creators. Water levels and currents are constant or generally predictable and follow an annual cycle. The reservoir is a good location to dive for information about the past, in an underwater world free from tumultuous waves and current, less prone to marine life interference, close to shore, and with a known location. Within the reservoir, the underwater archaeologist finds a place, not free of complications, logistical difficulties, or necessary ease of access, but rather a body of

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<sup>2</sup> Drawings, plans and photos of the feature, if the archaeology was properly planned and surveyed before inundation.

water in which the effects of water and the erosive nature of both the water and suspended particulate can undergo careful studied and monitoring year after year.

Due to the nature of archaeological sites, there is little concern for looting or treasure hunting, as is sometimes the concern of marine archaeologists studying shipwrecks. Poor visibility and the potential for more difficult shore access makes recreational diving less appealing, and therefore the sites are less disturbed than the locations of well known sites that may be located in warm, clear and visitor-friendly waters.

The question of why reservoirs are important studies areas is also due to the timing of this study. Around the world, there is a pressing need for more dependable sources of drinking water and energy, as the world population blossoms to over seven billion- and expectations of population increases from 8-16 billion by 2050. With this imperative and increasing need for dams, the need for a better understanding of heritage at risk also rises. The threats sites face during dam construction are poorly documented and poorly understood by the general cross-section of developers and archaeologists. In a working paper, submitted by Brandt and Hassan to the World Dams Commission (2000), numerous issues are discussed that affect cultural heritage management and dam development; among these, a lack of adequate training and understanding amongst personnel, and poorly implemented and enforced legislation. The need for further investigation into this important topic given the increase of the construction of dams is documented.

The work conducted in reservoirs and the research surrounding submerged archaeology is directly applicable to at risk sites located along shorelines –both fresh and saltwater- around the world. Global warming and changes in sea level are

prominent concerns at the moment, are playing a big part not only in the sciences where the research is being conducted, but also in politics where large sums of money are being reallocated internationally and domestically to further study, document, and understand how the natural environment is changing (GAO 2014). With work focusing not only on policy, but the practical aspects of how reservoirs affect and change sites, all of the data collected about erosion, the draw-down zone<sup>3</sup> and how damage might be successfully mitigated are all directly applicable to our shorelines' most vulnerable archaeological sites.

#### **1.4 Importance of topic in cross-cultural setting**

The importance of discussing and analyzing the processes surround archaeological site submergence<sup>4</sup> in a cross-cultural context cannot be emphasized enough. Archaeology is dominated by micro-analytic<sup>5</sup> research, which needs to be broadened if archaeology as a discipline is to survive (Van der Leeuw & Redman 2002). Archaeology needs micro-analytic research; it drives the discipline forward by contributing ever more accurate and original research, thoughtful treatises, and insightful, specialized knowledge about local and regional pasts. However, archaeology also needs broader research agendas, ones that draw together these smaller, localized histories and pulls them together into large-scale comparative ones.

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<sup>3</sup> The draw-down zone in a reservoir is the area in which water levels fluctuate on a, generally, annual basis. It is roughly the equivalent of the intertidal or coastal zone of tidally affected bodies.

<sup>4</sup> For the duration of this paper, this term denotes submergence of sites in reservoirs, unless otherwise stated.

<sup>5</sup> Micro-analytic is taken from the study of economics in which the economy is studied on two equally important levels: microeconomics and macroeconomics. The author suggests that archaeological research move toward this greater macro-oriented approach, rather than focusing on micro-data.

Of course, this latter type of archaeology happens all of the time: it is the archaeology Fernand Braudel discussed at some length in “The Mediterranean and the Mediterranean World in the Age of Philip II”, and it is certainly occurring at centres for varying types of ‘holistic’ studies. This work proposes that one informative means of understanding and analyzing archaeological site submergence is through the analysis and comparative study of larger regions. Throughout this work, a revised “Braudelian” approach is applied: i.e. the smaller details of site submerge are studied with an applied underwater archaeological methodology, the country’s policy is analyzed with respect to reservoir archaeology, and the larger, international scale attitudes, laws and trends are discussed.

This work does not even begin to converge upon the thousands of years<sup>6</sup> worth of history that could be undertaken about the unique histories of the sites investigated; that work would provide far too great a body of work, while simultaneously allowing little space for political discussion. This cross-cultural approach does not begin to untangle the strands of individuals nationhood’s complex histories; only those specific and needs based histories of archaeological sites and peoples whose histories have directly affected reservoir construction, the relocation (or *in situ* status) of archaeological sites or monuments, or the politics surrounding these issues. Instead, modern politics, developmental concerns, archaeological imperatives and local attitudes are all addressed and scrutinized, allowing for a more holistic understanding which points toward the best path for future projects: a sustainable future for reservoirs and effective archaeological protection policies and guidelines.

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<sup>6</sup> As commonly understood when referring to Braudel and his unique ideology of “la longue duree”.

Cross-cultural analysis is also known as comparative analysis (Narroll 1961: 221; Morgan 1877). It is a method that is central to many social sciences involving the comparative examination of different cultures; the argument herein is that archaeology and dam building is human behavior, slotted within the confines of unique and diverse cultures. This method is crucial for distinguishing universal aspects of dam building, while at the same time providing cross samples of the best and worst ways of providing protection to each culture's unique heritage. Arguably, a significant portion of the body of this work is policy-based assessment, and policy analysis is among the many social sciences. Therefore, anything less than a cross-cultural analysis would be a study of an individual site or region, with foreseeably little value for international application or policy guideline creation.

By using a broad and diverse range of sites, the need for greater cooperation and exchange of information in the heritage sector is also highlighted. Until very recently, a prominent study of archaeology in reservoirs was not widely or internationally available<sup>7</sup>. Since 1981, hundreds of reservoirs have been created, meaning hundreds (if not thousands) of archaeological sites submerged. The wider dissemination of this data would not necessarily have changed the number of reservoirs created, but education, resources and research in submerged archaeology may have been far advanced from where it is today. This highlights the necessary transition from national dissemination of knowledge to the international level.

## 1.5 Layout of dissertation

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<sup>7</sup> This is the Lenihan Study from the US National Park Service (1981). It will be examined in detail later.

This work is laid out in six chapters; these are then further broken down into appropriate sections and subsections in order to more clearly categorize information from two primary disciplines: archaeology and policy. Chapter one provides an introduction to the overall body of work, providing key foundations such as the methodology and literature review.

Chapter II is dedicated to the presentation of information about dams, their adjacent reservoirs, reservoir hydrology, sedimentation and particulate suspension, stratification in the water column, and how all of these factors can have an adverse effect on archaeology. The cost-benefit approach to dams is explained, as is the hydrology of reservoirs, sedimentation rates, controversies surrounding large dams and overall human rights perspectives about dams.

Following on, Chapter III focuses on the limnological<sup>8</sup> effect of reservoirs on archaeological sites and materials. The full effects of submergence, re-emergence, and the varying degrees to which archaeology can be preserved or destroyed is suggested.

Chapter IV provides an analysis of the exceptional body of legislation of the three case studies. How each country's policies differ in their application, effectiveness under the auspices of which governing body they fall, how they have evolved and which acts or amendments have usurped or melded to form current legislation- all of these topics are covered. Analysis focuses on each country individually, then moving discussion to the international and regional conventions and policies that apply to each set of domestic legislation.

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<sup>8</sup> freshwater



Chapter V considers three case studies, focusing on the UK, the USA and Egypt. Many more case studies exist than could be covered in this work. These countries have distinct reasons for their respective selection, ranging from the cultural dimension to the political. The reason for their selection, and the ultimate reason to choose them over other noteworthy cases will be set forth, and a short segment on each country's overarching heritage/archaeological body of legislation will be introduced. The following sub-section is made up of important parts: defining site characteristics of each case study, the archaeological record of these sites and their cultural significance, the applicable legislation, and the overall effects of inundation on the sites and the current site status and monitoring events taking place. The results of the underwater fieldwork undertaken in Scotland is also presented.

Chapter VI is the final body of analysis and information before the evaluative and concluding remarks, which make up the conclusion. As such, Chapter VI considers the long-term efficacy of legislative implementation and the long-term effects of submergence on archaeological sites. Physical contributing factors will receive due discussion and analysis in the beginning of this chapter, with the argument hinging on interdepartmental and international cooperation, and the dissemination of current understanding and implications of inundated archaeology. A cross-cultural examination of reservoir sites will be undertaken, with advantages, shortcomings and areas of both excellence and need for improvement addressed. The means through which all national reservoir programs can be enhanced and better developed will be proposed based on the overall body of work's analysis and field work

findings. This chapter also proposes areas in which the information and data collected in this research is applicable to other areas in archaeology.

The summary and conclusions chapter will bring together the work into a final meaningful discussion of case studies, concluding arguments, and a thorough evaluation of the work conducted. This evaluation is a comprehensive overview of the dominant studies and assertions, those works' scopes, shortcomings, areas for potential expansion, and its applicability to real-life scenarios (other areas of archaeological and CRM policy and site monitoring). A final set of recommendations and discussion, based on earlier assertions, conclude this work without the introduction of new materials or ideas. A final summary will highlight key points of the work, focusing on the aim of the work, its conclusions, field work evidence, and final remarks on current policy, and the direction in which archaeological policy is headed, internationally.

## CHAPTER 2: LITERATURE REVIEW

What follows is a discussion of literature that most closely applies to the idiosyncratic issues surrounding submerged resources, taken from a variety of disciplines. They are divided into types based on closely grouped categories, each discussing a different type of issue with dams, reservoirs and archaeology forming the central axle of these divergent spokes. The review follows on from the argument that archaeology submerged in reservoirs is deserving of attention post-inundation; all archaeological resources in reservoirs are not always or inherently damaged; and national policies do have a direct and meaningful effect on archaeological resources. Through the analysis of these policies, one can not only better understand those direct and trickle down affects, but one can also alter that policy *and* the response of archaeologists to better represent, protect, and monitor archaeological resources without undue cost or haste, or unnecessary conflict and impasse with developers- those developers hereto seen as “winning” the case against archaeology.

The final categories for subdividing relevant literature is as follows:

1. Pivotal works in underwater archaeology and the inclusion of inland waters, focusing on the works of Muckelroy, Munro, and the underwater archaeological contributions from Scottish archaeologists;
2. Discussion of the landmark studies, the “National Reservoir Inundation Survey” and the World Commission on Dams working papers;
3. Theories behind cultural resource management;
4. Excavation vs. *in situ*;
5. Other relevant or potentially useful literature reviews.

Further and analytic consideration focuses on individual national policies. However for the purpose of maintaining flow and sense of each country's unique approach, these legislative acts, policies and laws are discussed in the case study pertaining to that specific country, and serve as the basis for Chapter 4, and therefore do not feature in the literature review of this dissertation.

## **2.1 Underwater Archaeology Overview**

With the earliest recorded date of specific interest in exploring or making use of the world under the water dating from Alexander the Great's submergence in a large bell at the Siege of Tyre in circa 300BCE (Woosley & Perkins 1854), the history of underwater exploration has a long history. Notable interest in the act of diving and, specifically, underwater archaeology derives from somewhat later periods. Two men dove in the Tagus River in 1583, in the presence of Charles the Fifth, remaining underwater for greater than 20 minutes. A century later, Phipps and Treileben used the technology to salvage monies and weaponry from two different sunken ships (Babits & Van Tilburg 1998). The interest in dive technologies and their application to underwater intrigues grew exponentially over the course of the next three hundred years, until the renovations in dive technology by Cousteau and Gagnan rendered SCUBA and diving more easily accessible to the layperson than ever before (Babits & Van Tilburg 1998).

As dive expeditions broadened to become more inclusive of underwater archaeological investigations, the methodologies and number of wetland and underwater excavations also advanced, although interest in shipwrecks and marine archaeology has historically outweighed interest in freshwater archaeology (Cohn 2000). Interest in submerged archaeology remains at a critical low, though rescue

excavations in pre-flood zones occur yearly around the globe with large sponsoring institutions, such as the British Institute, the American Institute of Archaeology, and the World Bank. Calls to attention in the form of various publications and working papers are readily available (Welsby 2006; Cunliffe, De Gruchy, Stammitti 2012; Arthur & Mitchell 2010), although many of the publications, without post-inundation evaluation, assert that reservoirs are inherently damaging and destroying world archaeological resources at an alarming rate.

## 2.2 Seabed Distribution Theory

One of the primary concerns about submerged archaeological resources is how the reservoirs' incoming waters will redistribute the site or feature, and if or how it will become settled and at some type of equilibrium on the reservoir floor. Submerged archaeological features are much like shipwrecks- they are waterlogged and temporarily hidden archaeological features, still providing information and cultural identity reference. While some other factors differ (i.e. seawater versus freshwater effects) a closer look at seabed distribution theory and the following equilibrium theory is necessary. Muckelroy's work on shipwreck site redistribution and the equilibrium those sites reach with the surrounding environment has application to reservoir archaeology, although the work must undergo evaluation and then modernization to fit the special considerations of reservoir conditions.

Muckelroy published one of the keystones of his work while at St Andrews in 1976, describing an extensive research project investigating new methods of underwater site investigation and interpretation (Muckelroy 1976: 281). His plan comprised three key parts, of which only the first part is applicable here. The first part was broken down into five processes or phases, by means of a flow chart (see

figure 1). Through these distinct five phases, a ship transforms from an “organized collection of items into the assemblage of artifacts observed on the seabed” (Muckelroy 1976: 280). All five processes, from the wrecking of the vessel to the excavation of the material, represent forces that continually disorganize the ship and its contents; Muckelroy called these forces scrambling devices (Muckelroy 1976: 286). Three of these processes also represent forces that remove material from the wreck site as well; these he called extracting filters (Muckelroy 1976: 283). By deconstructing and understanding the characteristics of each process, Muckelroy argued that it would be possible to reverse the effects of each hypothetically, reorganize or add artifacts, and thus recreate the original composition of the ship. This diagram, therefore, was an interpretive tool that could guide Muckelroy and other archaeologists through their analyses of underwater wreck sites.

Praise to Muckelroy’s work for its originality and untimely usefulness in interpreting wreck sites is due (Harpster 2009; Schiffer 1987; Ward, Larcombe & Veth 1999; Gautier, Kharaka & Surdam 1985), and many of researchers have attempted to add predictive qualities to this model. Ward et al (1999), for instance, have utilized the Karman-Pradtl equation in conjunction with the seabed distribution study, in order to make assertions about the nature of wreck sites.

Other researcher’s aims have been somewhat varied from Muckelroy’s, and while it is fair to say that in the late 70’s, this model was considered cutting edge in a field that was just beginning to blossom, methodologies have changed and perceptions of archaeology evolved. Criticism has been forthcoming by Gibbs (2006), Stewart (1999) and Wheeler (2002) for Muckelroy’s focus on the environmental or natural factors shaping a wreck site. Muckelroy's model stresses

the disintegration of perishables and seabed movement encapsulating the physical, biological and chemical processes acting upon specific sites, and thus does not include pre-depositional formation processes (Souza 1988). It gives neither credit to the life history of the vessel (Gibbs 2006: 6; Auer 2004: 278), nor shows any interest in the cultural factors affecting assemblages.

Critics such as Gibbs (2006) and Souza (1988) contend that Muckelroy's work does not significantly address the life "history" of the wrecked vessel; that the vessel's life does not end with its redistribution on the seabed. When one considers Muckelroy's work in terms of submerged sites, rather than just shipwrecks, it is obvious that some aspects of the model remain applicable. In the shortest *durée*, the site's history has really just begun and this is particularly applicable in the case of sites submerged in reservoirs (Braudel 1972; Rönby 2003). While the site, un-submerged, may have had one common "history", the newly submerged site will take on its own new shape, distribution and meaning. In order to synthesize these two perceptions of underwater archaeological sites (cultural and as a setting in the environment or geology), a new flow chart model (figure 2) is proposed, formulated specifically for sites in reservoirs.

This flow chart (figure 2) is the first that addresses both the environmental and cultural factors surrounding an archaeological site. No such charts currently exist to address either factor in reservoir archaeology; underwater archaeology as a discipline has not yet begun to study sites submerged by reservoirs, thereby making these cross-disciplinary equations and comparisons necessary, but purely predictive in nature. Only field research will expand the available literature and determine to what extent these juxtapositions and models hold true.

## 2.3 Scottish underwater archaeology

The study of freshwater archaeology in Scotland dates back to the 19<sup>th</sup> century, when the studies conducted by Dr. Robert Munro on the sites of drained crannogs initiated. The Scottish Archaeological Research Framework (SCARF 2012: 6) notes that Munro was “inspired by the results of investigation of the Swiss lake dwellings... and published his observations of Scottish crannogs, producing a series of papers and culminating in the seminal work *Ancient Scottish Lake Dwellings* in 1882.” The study of the crannog is closely applicable to the study and understanding of submerged archaeology in reservoirs since a number of shallow excavations have taken place with great success, as well as the excavation and study of crannogs along lakes which have long since been drained. Little study took place in Scottish freshwater environs from the late 19<sup>th</sup> century through to the mid-20<sup>th</sup> century. A few noteworthy excavations took place in this period (see Montieth and Robb 1936; Ritchie 1942; Piggott 1953), but these, too, took place toward furthering the understanding of crannogs, some of which lie waterlogged, but above the waterline (e.g. The Buiston Crannog, in Ayrshire excavated by Munro in 1881; Barber & Crone 1993).

The full application of Scottish freshwater study to reservoir archaeology is not in understanding crannogs as such, but rather, in understanding sites submerged and then drained repeatedly. The collective review and evaluation of the contributions of the works of Morrison (1985), Crone (1993), Dixon and Topping (1986), Henderson (1998), Holley (2000), Cavers (2010), Strachan (2012) and Mowat (1996) provide an understanding of local (to Scotland) works undertaken, conservation efforts and the value of data produced, in a similar freshwater setting.



All of these publications address crannogs specifically, saving the works of Mowat and Strachan, who separately conducted studies of logboats in Scotland. These are all important contributions with differing contributions to this dissertation's overall understanding of submerged archaeology and fieldwork case study, while at the same time providing an opportunity for this doctoral work to contribute to the existing literature.

Morrison (1985), Crone (1993), Dixon & Topping (1986), Henderson (1998), Holley (2000) and Cavers (2010) works have all collectively revolved around the excavation, understanding and detailed analysis of artefacts, timbers, and construction of crannogs in Scotland over the last thirty years. Dixon's work on Oakbank Crannog on Loch Tay has remained the most extensive singular crannog excavation, with subsequent recreation of the structure, and tight radiocarbon dates (Dixon, et al. 2007). The works of Morrison, Crone, Henderson, Holley and Cavers, one might consider as a more holistic approach to understanding crannogs, and their place in their environment and in the archaeological record. Crone (2006) was able to very accurately C14 date timbers, which were then wiggle-matched to correspond to a larger group of Scottish crannogs (2010). Holley's work assessed old data with new sites, creating a gazetteer of sites and providing fresh insight through spatial and agri-functional analysis. In addition to these crannog studies, recent Scottish freshwater excavations were carried out under the supervision of David Strachan on the Carpow Bronze Age logboat: an excellently preserved specimen, which has survived so well owing to its stasis in freshwater (2012). Mowat (1996) provided a comprehensive study of logboats in Scotland.

However, understanding crannogs and their distinct contribution to archaeological records is only tangential to the greater contribution of these works. The sheer volume and data produced from their research on crannogs -which, as established mirror many of the qualities and environmental factors found in archaeological sites submerged in reservoirs- illustrate the potential preservative values inherent in reservoir floors. If an Iron Age crannog can survive fluctuating water levels and eventual drainage, why can a more recent structure not survive? Surely, many crannogs were destroyed as the result of too much erosion, dramatically changing temperature levels and general decay, but the point derived from the crannog studies is that preservation can and does happen, and in all the above cases, with large quantities of verifiable and quantifiable data extraction. Further, the study and contributions of data of crannogs in Scotland have proved useful in understanding Scottish [pre] history, and remain applicable and expandable to broader histories.

## **2.4 Freshwater archaeology pertaining to reservoirs**

Despite the lack of hereto-critical lack of information specific to dams, policy and effect of reservoirs on archaeological remains, the need for a better-developed field of freshwater archaeology was called to attention as early as 1961, by archaeologist Donald Jewell of the California State Department of Parks and Recreation. Jewell (1961) asserted that, “because fresh-water dams are flooding areas faster than archaeologists can investigate them, it has become urgent to develop a method of underwater archaeological work.” He further suggested that in California, as well as in other areas of the country, two primary objectives should stem from this research: the recovery of data endangered by too long exposure to the

destructive action of water, and the recovery of data protected by the preservative action of water (Jewell 1961). It seems then that Jewell poses an excavate-excavate scenario, despite later in the same publication citing evidence that the archaeological remains would survive hundreds of years, thereby displaying his preference for invasive archaeological excavation to years of *in situ* preservation. However, it seems likely that Jewell, who identified himself as a scientist (1961), paired with his geographical location and period of primary fieldwork and research in Southern California, subscribed to the theoretical and methodological ideologies of the Ecological-Functionalism. If one examines Jewell's research interests and career in the California State Parks system, it is clear that a need for more and better information, used predominantly to procure information about Native American settlements and sites, were at the pinnacle of his –and the State system's- objectives. This Eco-Functionalism (also known as cultural-functionalism) movement laid the path for the “new archaeologists” of the 1960's, whose younger generations of archaeologists then diverged again to form the processual and then post-processual movements of which archaeology is now more closely aligned.

Jewell's predecessor, Hutchison, earlier described the different types of freshwater archaeological fieldwork an archaeologist could undertake, which he described and classified as lakes produced by the complex behaviour of higher organisms and further as “type 73”: dams built by man (1957). Hutchison never made requests for further research into reservoir archaeology. Perhaps the technology for such pursuits was not readily available enough for such endeavors or the concept of diving in reservoirs was too new. The reason is unknown. However, his works did have an effect on Jewell, as noted by Jewell's repeated referencing of

Hutchison. Jewell's calls for further research into the field of freshwater archaeology, while those of scientific data retrieval rather than toward better cultural resource management, were part of the chain of events leading up to one of the most comprehensive studies found worldwide, focusing on inundated archaeological features in the USA: the National Reservoir Inundation Survey (NRIS).

## **2.5 The US National Park Service National Reservoir Inundation Survey (NRIS)**

One of the least widely published studies, but among the most scientific and informative of the effects of reservoirs on archaeological sites is the National Reservoir Inundation Study (NRIS) compiled as a massive joint effort of the US Army Corps of Engineers, the Bureau of Reclamation, the National Park Service and Soil Conservation Service. The final report, comprised of two distinct, large volumes analyzes on many levels those affects of reservoirs on submerged archaeology. Written over a four-year period, and published within the US Department of the Interior, it geographically addresses most of the distinct geologic regions throughout the United States having special case studies contributed from a variety of researchers in varying reservoirs throughout the nation.

Lenihan, the key author and project director, quickly points out that while the study remains the synthesis of many researchers' contributions and efforts, the core team remained completely objective as its final conclusions. He suggests that the outcome of this report mattered very little, but that the important objectives lay in a more holistic understanding the reservoir's effect on archaeological sites. This evaluation in no way suggests that this work is intentionally biased. However, like any large body of work, highlighting the culminating efforts, funding and resources

of multiple departments of the US Government, it is likely to display some symptom of its generational paradigms and overarching objectives of the funding bodies, regardless of the efficiency and professionalism of the authors. As this report is considered one of the most important publications of its nature to this project, due care is taken to fully explore it, before comparing it to a more recent document which is considers many of the same issues within the wider field of cultural resource management, through an international perspective.

The NRIS begins with a list of six observations resulting from its findings, and it is by reviewing each of these points that this project's evaluation of it is biased. Evaluation based on these provides an accurate representation of what a policy analyst or legislator (for whom the report was intended) would read, given lack of time and brevity of the points. After the discussion of these observations, this literature moves on to discuss other relevant pieces of literature, returning in Chapter 1.2.11 to further discuss the limitations of the NRIS and how this dissertation follows on from the works of it and the other reviewed publications.

The first observation listed in the NRIS (1981: 5) asserts "the overall effects of reservoir inundation on archaeological resources in any given area are unquestionably detrimental in nature." In justifying this observation, discussion continues that states that "highly sensitive" cultural resource bases are subjected to "radical" environmental changes, and further that the "use of inundation as creating data banks for the future has limited utility" (NRIS 1981: 5). This statement assumes that archaeological resources are always culturally sensitive and that the so-called radical environmental changes that occur have equally destructive effects. It further indicates that the NRIS project had little or limited interest in preserving

archaeological or cultural resources *in situ*, since section 1.2.2 displays ample evidence that submerged archaeological resources contain an abundance of useable data, held in stasis for generations. The purpose of creating reservoirs should never be with the aim of creating data banks of archaeological or cultural resources. Rather, the archaeologist, whose role is often ill and contentiously defined, must balance the socio-cultural needs of the archaeological record with those of future generations, stemming from their roots as anthropologists. Using reservoirs to “contain information” is a means of controlling the perception of damage to sites, which even the NRIS (1981: 196) later describes through individual site analyses, as in a state of good preservation.

Observation 2 (NRIS 1981: 5) explains that the NRIS project found “the traditional response of the archaeological community to the threat of inundation” as “often ill-conceived and parochial in nature”. It further pointed out that “...conducting large scale, site-specific excavations on the basis of a priority list of the ‘most important sites’ leaves much to be desired, and is happily coming under fire within the discipline itself.” The NRIS findings in this front concur with the findings that are presented in this project, in the conclusion. In the 30+ years since the publication of the NRIS, little has changed in the way that archaeologists respond to potential site inundation. Even the recent work conducted in the flood basin of the Merowe Dam (Welsby 2006) did not take a different consideration of the rescue works undertaken. As recently as July 2011, representatives from a range of careers from within the heritage sector, convened to discuss the issue of submerged archaeological resources at the “How to Build a Dam and Save Cultural Heritage” workshop at Durham University. While debates about ethics in excavation played a

key role, most of the presentations and discussions revolved around what individual archaeologists had excavated during his/her rescue missions to pre-inundation zones, and which sites “seemed” the most important. No final consensus about prioritization of site excavation or preservation came to fruition, lest of all in a scientific and logical way. Ideas about the importance of sites, and which of those held most meaning and should therefore receive greatest attentions, were as subjective, varied and individualistic as the representatives’ motivations for becoming archaeologists in the first place.

The third observation dedicates discussion to assessing the notion of site protection as “a viable alternative to the ‘excavation only’ syndrome” (NRIS 1981: 5-6). Although the nature of salvage archaeology and its associated concept of archaeology by contract underwent intense scrutiny, criticism in this segment relied primarily on methodological grounds. No one challenged the idea that the whole concept of emergency data retrieval might not be the only mitigation option. Many of the basic assumptions about what happens to archaeological data in reservoirs remained unaddressed. This was in spite of the fact that as early as 1960, Donald Jewell specifically noted in *American Antiquity* that we should again consider what really transpired at sites submerged in reservoirs (Jewell 1961).

Further, issues revolving around site protection were predominantly limited to concerns about perceived long and short-term costs of mitigation and monitoring efforts, suggesting instead that partial site excavation should remain the priority, lest vulnerable data be lost. By partially excavating at a lower cost, Lenihan asserts that the longer term costs of monitoring will be as limited as possible, though still more expensive than full excavation pre-inundation (NRIS 1981: 6). In the thirty years

since this report's release, advances in SCUBA technology and the revision of dive safety, the US Navy dive tables and diver training standards (PADI 2010), and greater public/scientist accessibility to all of these, means that long term monitoring no longer need cost as much.

In a strange circumstance of contradiction to observation one, observation four (NRIS 1981: 6) points out that "there is a critical lack of understanding of the importance of reservoir zones with regards to differential effects on cultural resources." While this statement is true and justified in the rest of the observation four's paragraph, observation one clearly stated that reservoirs are inherently damaging to cultural resources. Additionally, one struggles to understand why this is one of the main observation points, when the objective of the project was meant to provide a critical understanding of reservoir effects on cultural resources, noting that it did not take into account the cultural resource that the reservoir itself becomes. One logical conclusion then, is that addressing the lack of understanding was to prompt more archaeological work and survey in the future. It would provide work that is more detailed and better data from which to draw, while simultaneously providing justifiable archaeological work during four years worth of national unemployment increases and the 'double dip' recession that would was currently underway in the early 1980's (Knoop 2004).

The last two observations (five and six) warrant discussion together. Observation five suggested that post-inundation managerial action must play a much larger part in the mitigation process, while observation six stated that communication between reservoir planning and construction personnel and archaeologists should greatly increase (NRIS 1981: 7). As such, both observations take into account the



lack of communication between aforementioned parties, and proposed better action of all types, post-inundation. The “How to Build a Dam and Save Cultural Heritage” workshop at Durham University came to these same conclusions (Cunliffe, De Gruchy, Stammitti 2012) decades post-NRIS, as did the World Commission on Dams Report (2000), which is analyzed in the next section. Both observations five and six are certainly warranted as well as worth questioning the following of them: Why have they not yet been addressed or better actions implemented? To what extent do national reports shift policy agendas, and to what extent do reports affect archaeological and cultural resources? Discussion in the analysis chapter of this project addresses these questions in greater depth.

## **2.6 World Commission on Dams Report (WCDR)**

The World Commission on Dams commissioned a working paper entitled, “Dams and Cultural Heritage Management”, which reached publication in August 2000. Compiled by American archaeologist, Steven Brandt of the University of Florida, and Egyptian archaeologist, Fekri Hassan at University College, London, and this large collection of working papers represents the works of scholars from six continents, all concerning cultural heritage management and dams. This volume was later turned into a book, “Damming the Past: Cultural Heritage Management and Dams” (2006), which is unavailable for purchase or [library] lending for review. The WCDR addresses case studies geographically, with each continent forming one section, with prefacing chapters concerning cultural heritage as a human right, a short section on the international organizations funding excavations and the World Commission on Dams’ research, and closing chapter comprised of authorial remarks and recommendations. As such, it is extremely comprehensive, detailing a variety of

works conducted from the heritage management aspect, to the logistics of site excavation and investigation.

The common themes that run throughout the papers featured in the WCDR are:

- The rising and imperative need for better pre-inundation excavation and investigation;
- The inherent basic human right of indigenous populations to their archaeological past (termed “Cultural Heritage” in many of the papers);
- A repeated assertion of the damaging effect of reservoirs on inundated cultural heritage, and the need for increased awareness of these issues.

These issues are addressed in nearly every paper presented in the WCDR, albeit through the lens of a different case study, but the inclusion of remarks paraphrasing these key points only serves to highlight their perceived importance and emphasize the current popularity of these scholarly opinions. Despite its commission by a political lobbying group at the international level, issues of law and policy remain largely omitted from WCDR, touching instead on the infringement of dams on human rights. This emphasis on human rights abuses stems from one segment in the WCDR (2000: 5):

“The right to a cultural heritage is an integral element of humanity, as implied in Article 27 of the United Nations’ Universal Declaration on Human Rights, and that the diversity of such resources is essential for sustaining our ability to cope with the past, present and future. The loss of the cultural heritage of any population is a loss to all of humanity as it weakens our fabric and diminishes the pool of knowledge and wisdom from which we draw our strength and resilience. We cannot rehabilitate or restore what has been lost, but we can prevent the loss of cultural heritage that is now eroding our stock of experience and ability to respond to adverse conditions.”

Notwithstanding this author's and dissertation's agreement with the overall themes addressed within the WCDR, this notion regarding the nature of cultural heritage as implied by Article 27 is over-aggrandized and does not hold up to the actual Article 27 or the truth about resources in reservoirs. Article 27 of the Universal Declaration on Human Rights states:

“Everyone shall have the right freely to participate in the cultural life of the community, to enjoy the arts and to share in scientific advancement and its benefits.”

In analyzing this article, the very dams and reservoirs that would seem to infringe upon this right are actually the scientific advancement, with clean water and renewable power sources, the benefit. If one considers the matter from a different humanitarian perspective (that does not take Article 27 into account) one must take into consideration both Hodder's (2001) and Meskell's (2010) views, that cultural heritage is a legitimate right, not a basic human right. Cultural heritage in this sense, as a basic human right, does not exist. It has not revealed itself as the great thread for pulling together all of mankind as has often been hoped for and attributed to it. More often, it serves to help form the basis of nationalism or regionalism, posed from one regime's ambitions to the next. Further, by claiming that cultural heritage is a basic and essential human right, we diminish certain other legitimate basic human rights: justice, peaceful assembly, religion, and the often-quoted “self determination of peoples”. We, the outsider archaeologists, whether western or from a thousand years after the last person inhabited a site, are driven by a need to consume and represent knowledge of deceased populations. That need of ours does not equate to basic human rights either in others or in ourselves, but rather, is

representative of those whose desire for knowledge, funding and understanding tries to outweigh and impress upon the real needs of others, their own agenda.

The WCDR emphasizes the loss of cultural resources around the world but falls short of addressing the likelihood of those resources' survival of the reservoirs inundating them, excludes an analysis of the policies that brought matters to the present state, and does not discuss the varying nature of perceptions of cultural resources and changes in normative values. If we have learned one thing from years of cultural resource management and archaeological research, it is this: archaeological resources change in meaning, significance and value to those surrounding them. The very meanings of the sites evolve over time, and within the minds of each person beholding them, and legitimate rights to those resources then become an issue of cultural resource property law and cultural heritage theory.

## **2.7 Cultural Heritage Management Theory**

The study of archaeology and cultural heritage management (CHM)<sup>9</sup> are inextricably woven together. When archaeologists are called to survey, consult, conserve or excavate, cultural heritage specialists, sometimes themselves archaeologists, are called upon to determine the ethics involved in digging a site, legalities for post-excavation claims and ownership, and to investigate the potential parties necessary to notify about the excavation. Because there is so much overlap between the two disciplines and because at times the archaeologist and CHM specialist may be one in the same person or organization, the theoretical underpinnings are often the same body of theory. In the case of archaeology and

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<sup>9</sup> Cultural Heritage Management or "CHM" is at times referred to as Archaeological Resource Management in Great Britain, although both terms may be used interchangeably.

CHM, not all theory is the same. “Hard archaeology” theory, that is, archaeological in the purest sense of the disciplinary study of the material past, would include discussion about how archaeology was shaped by the Marxists, the processualists and post-processualists. Where other archaeology dissertations may discuss at length these ‘hard archaeology’ theories and their effect on the author’s work, this dissertation diverges from that tradition to focus predominantly on cultural resource and cultural heritage management theory.

CHM, sharing some basic theory and technique with archaeology draws upon other fields’ theoretical inquiries and standards, paired with its own archaeological needs, to create an idiosyncratic and at times discordant grouping of discipline standards from which experts can draw upon dependent upon their individual involvement and world view. The parties potentially involved in cultural or archaeological resource management include: museum directors and acquisitions departments, archaeologists, cultural heritage property attorneys and specialists, native or indigenous groups, claimants to specific heritages, trade specialists, antiquities dealers, UNESCO policy writers and analysts. Therefore, CHM theory casts a much wider net than archaeological theory alone. As this dissertation is a blend of policy analysis, cultural resource management and archaeology, the theories presented and discussed within cultural resource management are more applicable to this dissertation and provide a better platform for later discussion.

The specialized theory approaches in CHM include: moralist, internationalist, nationalist, scientific, property law, and market based. What follows is a synopsis of these approaches, what they mean to cultural heritage management and archaeology. It concludes with an analysis of who benefits from each approach, and a synthesized

alternative to this array of differing methodologies, in the hopes of bringing a peaceful and formative resolution to the foreground should debates about the nature of ownership of reservoir resources emerge, with a basis for resolution should the need arise.

The definition of cultural heritage has been put forth in the UNESCO Convention Concerning the Protection of World Cultural and Natural Heritage as:

1. "Monuments: architectural works, works of monumental sculpture and painting, elements or structures of an archaeological nature, inscriptions, cave dwellings and combinations of features.
  2. Groups of buildings: groups of separate or connected buildings which, because of their architecture, their homogeneity or their place in the landscape;
  3. Sites: works of man or the combined works of nature and man, and areas including archaeological sites and finds therefrom."
- (UNESCO, 1972)

Values associated with tangible cultural heritage differ from culture to culture and there is no standardized method of calculating values of artifacts or sites. As Bruce Trigger points out, "There is no evidence that in their archaeology, archaeologists are less influenced by the milieu in which they live than they were formerly. Archaeological interpretations echo current concerns." (Trigger 1996) Thus the following six various approaches at heritage management have developed over many years, at times both converging and diverging, but always reflecting the society and individuals that developed them.

#### *Moralist Theory*

The Moralist theory derives from a desire to have cultural resources controlled by the right people, not because of some punitive external force, but because it is the honorable path. Sarah Harding, is a major proponent of this school

of thought. She proposes that a civilized culture should respect the values of the less powerful (Harding 1999). Among her arguments is one that suggests the main purpose of the Native American Graves Protection and Repatriation Act (NAGPRA) was to simply compensate the Native American population (Hutt 2004). Hence, Hutt states, the "inherent value of cultural assets is not regarded as a mere incident of culture; it is an indispensable aspect of cultural experience and the evolution of cultures" (Hutt 2004: 20). Moralists, although proponents of returning artifacts, do not assume that giving a society back its cultural resources will somehow compensate them for past wrongful actions or thefts; instead, the goal is to keep the offending society from repeating its wrongs. Social justice, rather than full restitution, is the final objective.

The idea of cloaking cultural treasures and associated information by collectors, scientists, libraries, or museums is moralistic heresy. Indian Law scholar, Howard J. Vogel, argues quite eloquently that to reach a moralistic equilibrium, clashes over control of cultural property must not be seen as problems to be resolved between assertions of private rights vs. government power; instead, they should be viewed as conflicts involving competing master stories. (Harding, 1999) True healing of the basis of conflict is achieved by seeking mutual appreciation of cultural diversity. Other scholars propose consensus building as a means to resolve conflict over access to cultural items (Harding 1999). The idea of consensus building is, in some arenas, itself laughed at as simply trying in vain to find a nonexistent middle-ground (Trigger 1996).

#### *Internationalist or Paternalist Theory*

Declaring that cultural resources are the property of humankind and that they should belong to those who can best care for them is the paternal mantra of the

internationalist theorists. The most outspoken proponent of this view is John Henry Merryman, who resolves the fate of artifacts best maintained where they are currently housed, where they may be free from overcrowding, negligence, or wanton destruction, and kept there in the public interest (Merryman 1989; Hutt 2004). In this sense, artifacts and other archaeological remains thus become an asset to tourism by possession.<sup>10</sup> Hutt states (2004: 21) that,

"It is of no concern to the internationalist that the source nation has contested the foreign possession of their cultural items in a consistent manner over time. Recognition of sovereignty of another is not an issue for the internationalist; their concern is primarily on control of objects under the guise of proper conservation."

The internationalist takes a worldview of cultural property, thus assuming that those who can take good care of cultural property should be those entrusted with it (Hutt 2004; Rand 1993). Internationalists assert that countries having an abundance of cultural items- such as Egypt, Greece, and Italy among many others, and certainly those countries whose cultural heritage exceeds their ability to afford adequate care or protection for it- should be pleased to share their cultural resources (Hutt 2004). This tenant is fundamental to the internationalist theory, even when the source country does not have a voice in the dialogue.

#### *Nationalist Theory*

The nationalist view of cultural items holds that cultural property is inalienable. This means that any nation taking possession of the patrimony of another can never take full title (Hutt 2004). This theory assumes that items have the

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<sup>10</sup> Sites, as well as artifacts, are subject to this. One excellent example is the number of Egyptian temples from the area now inundated by Lake Nasser, which as payment for the foreign nations' assistance as Nile waters threatened them, have been completely uprooted and placed on exhibit in foreign museums the world over. Egypt now demands the return of these temples but with little success.



highest value and optimum social benefit when they are in their place of origin (Coggins 2001). The nationalist theorist would supplant private property interests by restricting trade in the interest of cultural preservation (Coggins 2001). A great proponent of this school of thought was former Secretary General of Egypt's Supreme Council of Antiquities, Dr. Zahi Hawass.

For over a century nations have asserted their rights to cultural items by enacting laws to restrict exports of items considered as the nation's cultural heritage. This was particularly evident during the age of propaganda and nationalism most closely associated with the Third Reich. For instance, Hitler is known to have refused the return of the Bust of Nefertiti to Egypt, on the grounds that the bust represented a true Aryan likeness. Yet, in what could be considered contradictory, the nationalist would in today's society assume that the original provenience should dictate ownership of an item or set of items. Provenience is controlling, unless the chain of title establishes that permission had been lawfully given to the one claiming the interest, which is contrary or hostile to that expressed by a nation (McElfish 1996).

Perhaps one of the most controversial aspects of the Nationalist theory has been the idea of favoring the return of property to the nation of origin regardless of a demonstrated capability to conserve the item (Hutt 2004). The focus is clearly on sovereign control, even if destruction by neglect is certain or if the item will be lost to science or the market (Cloonan 2007). Hutt (2004: 23) points out that

"Nationalist theory is similar to moralist theory when it seeks to revert to the nation of origin items wrongfully removed, but it lacks the balancing mechanism of moralist theory, which does not limit the analysis on the question of political boundaries or sovereignty."

### *Property Law Theory*

Property law theory stems from what western countries deem an ethical construction of ownership rights (Hutt 2004). Rights of ownership are found primarily in written law, having derived from common law, an oral set of historical assumptions that have evolved in organized social groups. In each country, property rights for cultural items are determined by the common law of the country in which the property rests unless there is written law. The problem with this arises based upon the fact that not all common law shares similar assumptions about cultural property. In the United States, common law, having derived mainly from the British common law system, human remains are not regarded as property. They are treated as the embodiment of the human spirit to be laid to rest upon death and not to be disturbed. In this assumption, any goods found in the grave (personal belongings, religious icons, etc) remain with the deceased *in situ*, or in place. In matters pertaining to sacred items, ownership is deferred to the church in a sort of recognition of “communal ownership by the church or parish.” (Thomason 1999) Cultural heritage extends beyond items of worship. The efforts of property law theorists played a large role in the formation of the Native American Graves Protection and Repatriation Act in the United States, as the Act upholds the most important facets of this theoretical approach. The actual use of property law theory requires an investigation of facts and application of those facts to the rules of property transfer to determine rights of ownership.

Property law theory operates with a predictable set of assumptions, although this is not to mean that the theory is inflexible. Elements once thought to be beyond

analysis by this theory are now being analyzed by it!<sup>11</sup> Through a common law analysis of property rights, if cultural property items were removed without express permission, then the removal was lawfully wrongful in the first place, and further debates over which nation is most likely to provide the appropriate conservation methods is extraneous (Thomason 1990).

### *Scientific Theory*

The Scientific theory holds the right to knowledge and the human quest for scientific inquiry as the predominant claim over cultural property. The scientific theorist would argue that this scientific inquiry is of utmost benefit to humankind, and therefore the right to cultural property should be conferred upon those scientists who choose to study such items. (Hutt 2004) Scientific theorists, although at odds with market theories over who should control cultural resources and for how long, are not at odds with property law theories (Hutt 2004). Scientific theory prompts an array of questions from property rights theorists in regards to the scope and extent of permits to obtain materials, permission for the use of the materials, and individual domain over the items (Hutt 2004). This theory does not try to trump the religious or property rights of a group. Instead, their primary concern is one of access to study (Hutt 2004).

### *Market Theory*

The Market theory supports free trade and an open flow of items and knowledge in the marketplace (Lindsay 1990). Market theory rails against the retention of cultural property in the name of scientific inquiry, but supports the retention of cultural property by private collections for personal pleasure (Lindsay 1990; Hutt 2004).

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<sup>11</sup> E.g. Such as the use of air, outer space, and water, once thought to be limitless and beyond the boundaries of ownership.

### *Synthesis of theories*

At this point, the question must be raised of who benefits from these varied approaches and who feels the burden of their shortcomings. This line of questioning demands not only an answer, but also an explanation of benefits and shortcomings, neither of which have an unequivocal answer. The benefits and shortcomings of each outcome differ based upon the specific scenario, who the stakeholders or parties involved are, and how an agreement was settled upon. However, the very premise of this also depends largely on a best and worst case scenario mentality. For instance, which is worse: the loss of one's archaeological past and the remaining tangible pieces that make up an ethnic or cultural identity from potentially thousands of years of history? Or, the loss of "national pride" in the form of artifacts repatriated after having been housed in museums, and used as a boost to tourism revenues for the past century or less?

Every approach may be considered to have a clear benefit to whomever remains in possession of the artifact, while the defeated claimant or whomever has had the artifact or goods removed feels the greatest burden of its shortcomings. Ultimately, whether a grave good has been restored to its legal and rightful owner under NAGPRA or the British Museum in London retains such controversial pieces as the Elgin Marbles, the party feeling the greatest burden of guilt is the field of archaeology. Archaeologists, although often hailed as the heroes of tantalizing adventure movies and on the cover of various worldly magazines, still hold the stigma and potential of being naught more than educated grave looters intent on taking the gold and making a quick retreat. As archaeologist Sandra Onus writes in 1975 (2):

“It has been and still is the feeling amongst my people that archaeologists are a bloody nuisance only good for sticking their noses and tools where they are not wanted "just like most white men", and I have thought along those same lines myself in the past. This attitude has stemmed from the lack of understanding on both sides of the fence, although archaeologists have not really given Aboriginal people any cause to think otherwise. It could be termed a "communication barrier", and as it has only really been the archaeologist in the past who was interested or involved in this field of science, it is I feel up to them to establish an understanding and a respect between those concerned.”

Modern archaeology attempts to overturn this Indiana Jones-like stigma through better and more ethical archaeological practices, trained specialists in cultural heritage management, and an overall obligatory air to publish findings and make them accessible to the public. Improvements, however, are not perfection. Archaeologists cannot ignore the ethical ideals of the field, even if to some this “isn’t real archaeology.” This does not seek to imply that archaeologists are inherently “bad guys” nor indigenous groups the “good guys.” However, the days of easily distinguishing between right course of action and wrong are long over.

Archaeology must continue to distinguish itself from salvage operations whose only purpose is to remove contents from sites for profitable purposes. It must become *more* transparent and more frequently reach out to indigenous or native groups of peoples in an effort to obtain maximum involvement. Naturally, time cannot be rewound in an attempt to return artifacts to those groups who initially refused permission or who were simply not asked; nor can archaeology attempt to force one set of morals or idealistic approaches on museums and other large financially driven institutions.

For those who must daily address the concepts of internationalism or nationalism, market approach or property law, there is yet another outlet for disputes when these approaches do not provide clear answers or when too many stakeholders demand different outcomes: the potential for a dispute settlement mechanism within the framework of UNESCO. Given the general successes of past mechanisms in that intra-national body, the possibility for cooperation and collaboration to resolve cultural heritage disputes is very high (Stammitti 2007). Perhaps a dispute settlement mechanism can help to make reparations to those nations or groups most deserving of them, while redistributing the world's archaeological wealth in an equitable manner based upon the decisions of multiple scholars from many different geographic regions (Stammitti 2007).

In the meantime, there is little that modern archaeology can do to resolve the strident debates over which approach within the realm of cultural heritage management is best to follow. It is in the best interest of nation-states, indigenous groups, museums, private collectors, and other archaeologists that each excavator carefully considers the full ramifications of excavation, conservation and display. Multiple party involvement and discussion of research plans will provide the best means by which to allay and prevent future disparities from occurring.

The different approaches at cultural heritage management have provided a variety of means through which CHM specialists, museum directors, and archaeologists can strive to unravel issues surrounding illegitimately acquired artifacts, demands for the repatriation of artifacts and goods without solid records of provenience, and complexities in the planning of future excavations. All of the varying approaches are not necessarily mutually exclusive concepts. They are not

polar-opposite approaches to each other, nor are they irreconcilable. Instead, they are simply theoretical tools which, based upon differences in philosophical approach and understanding, were devised to make archaeological management easier and perhaps more “fair” to all players involved, regardless of how rich, poor, or underrepresented a nation or people may have been throughout the past.

The most difficult step for archaeology and cultural heritage management is past. The analysis of a system of approaches which do not consistently produce desirable outcomes has been undertaken, in addition to the the admittance of a discipline in ever more in need of improvements in the area of transparency and multiple-party involvement. Archaeology and CHM can continue to unveil the world’s great past in an equitable manner so to avoid future archaeological stigmas and fuel for politicians’ strident debates. As noted by author Michele Cloonan, “The protection of cultural heritage has been attended to in international laws, conventions, and theory... but it is the ‘large areas of no rules at all’ that continue to challenge all of us” (Cloonan 2007).

## **2.8 *In situ* preservation vs. excavation**

The pool of literature focusing on the controversial relocation, excavation or potential *in situ* preservation of archaeological materials is vast, and varying ideas about which method to choose depends largely on whether taken from an academic or commercial source. The pendulum-like debate over the preferred method of preservation i.e. excavation or preservation, has predominantly swung toward *in situ* preservation whenever possible when applied or discussed in academia. Due to this consensus in academic archaeology, this section will not analyse any specific text

regarding the differences and preferences of archaeologists. Instead this proves the backdrop against the new trend, the juxtaposition of the two views and the differences in environments that better lend themselves to one form of conservation over the other, and a critique of the process it underwent in establishing itself as the preferred form of conservation.

The decision whether to preserve *in situ* or to excavate is based largely on the perceived rates of potential deterioration in a given environ, funds available to properly excavate and then conserve and house a potentially large collection of finds, and how the decision between the two different methods will change accessibility to archaeological resources to the public. In underwater archaeology, the decision between *in situ* preservation and excavation is as timely and topical a matter for discussion as for archaeologists investigating on land. Marine archaeologists must contend with a variety of deteriorating factors: wood boring organisms located as deep in the open sea as 1000m, a variety of flora and fauna turning a shipwreck into a new and habitable environment (the growth of algae, corals or seaweeds), and the alkaline pH of the ocean (Ballard et al. 2000). Not without complications, freshwater archaeologists also handle complications in the environment: rushing and potentially erosive water currents, long-term pH and chemical changes in archaeological feature components, and shallower waters creating a greater likelihood of temperature fluctuations (Jewell 1961; Rory & Bourke 2009).<sup>12</sup> While these represent a bare minimum of observations about the factors archaeologists encounter that may endanger site stability or hasten deterioration, they serve to highlight the importance

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<sup>12</sup> Freshwater's effect on preservation continues in Chapter 3.



of the unique marine environment plays in the decision-making process leading up to the removal or documentation of archaeological remains.

Opinions differ greatly about the situations requiring excavation or *in situ* preservation, depending on the sector from which a specialist stems. Historically, *in situ* preservation is a relatively new method of handling underwater archaeological resources. The first *in situ* preservation took place in the 1980's on a wreck in the Dutch Wadden Sea, in which over 6000 sandbags and polypropylene nets were lowered into place (Huismann et al. 2008). In the years following the Wadden wreck project, several EU-funded projects, such as MoSS and BACPOLES, proved to the scientific and archaeological communities that *in situ* conservation was an effective means of stalling deterioration- although no form of conservation, above or below the water, is eternal (Manders 2009). It is also a politically driven method, lodged in Dutch, English, American, Danish, French and Belgian governments' policies, and generically referred to as the "Precautionary Principle" (Manders 2009). *In situ* preservation has become the preferred method of conservation whenever feasible, not only for the sake of conservation but also due to a lack of knowledge about treating some forms of *ex situ* deterioration (e.g. the treatment of sulphur problems currently affecting the hulls of the *Mary Rose* and the *Vasa*). Additional concerns include the gap between the number of underwater archaeological sites only recently accessible (through redesigns of SCUBA and innovations in ROV/AOV and remote sensing technologies) and the number of qualified underwater archaeologists needed to examine this new profusion of potential datasets and artefacts. Not only are thousands of newly qualified underwater archaeologists needed to complete these studies, should *ex situ* become the preferred method, but the high price of funding the

research and inevitable conservation of waterlogged archaeological materials makes excavation seem financially improbable (Richards 2012).

In the US and UK, the transition to *in situ* was gradual. In the United States, emergency (also called salvage—but different from British notions of salvage [law]) archaeology prevailed throughout the 1980's and into the 90's. It emphasized the rapid excavation of sites prior to their inevitable development (Brew 1961; Jennings 1985). The UK saw notions of emergency archaeology taken to new levels, as calls for attention and assistance from the British Institute came from Egypt, Turkey, and Romania (British Museum 2010). In many of these cases in the US, UK and 'rescue' abroad, emergency salvage did collect and save some archaeological data that would have otherwise and most likely have been lost (Jennings 1985). However, with only some small exception, the excavations lacked a follow through by thorough description, analysis and synthesis of the investigation results, a point further illustrated in this dissertation's case studies and analysis. As Childs (1996: 49) points out, "These failings contributed to the problems of archaeological curation and collections management [in the USA]..." and perhaps the most problematic aspect of this approach, was the fundamental failure to modify development or methodological plans so that sites would be conserved and protected rather than destroyed. To date, many most government agencies have incorporated new preservation policies. For instance, in the US the Bureau of Land Management and the National Forestry Service oversee archaeological projects. The projects involve every aspect of excavation, collection, analysis, reporting, and the curation of remains and association records, but the foremost emphasis is now on *in situ* preservation (Keel et

al 1985; McManamon 1992; McManamon et al 1993; Knudson et al 1995; Haas 1997).

Despite all tendencies pushing for *in situ* preservation whenever and wherever possible, there are still skeptics- most notably in the commercial salvage sector. Spearheaded by “Odyssey Marine Exploration”, salvors take to the seas in search of archaeological remains that may later find their way into museum or private collections with or without the academic rigor of lines of provenance, contextual data, or analysis. Founder of the company, Greg Stemm, suggests that *in situ* preservation leaves pieces of our collective past in the ground where they do little good (Morrison 2009). Fortunately and consequently, the salvage regime in the UK has no application to archaeological material deriving from limnologically submerged landscapes or submerged human habitation sites. The idea of salvage in a commercial ‘treasure hunting’ sense, rather than a legally justifiable one, has not yet entered the minds of reservoir divers. Whether this is through little public awareness of submerged archaeology or the perceptions that little of great value (or salability), reservoirs are for a time, safe from this threat. More threatening to these resources is not the odd salvor that may take an interest in archaeological resources, but the archaeological rescue teams and developers that demand full excavation of sites that will survive inundation.

## **2.9 Gaps in literature, dominant concepts, and suggested contribution**

In introducing the themes in the literature review, the author must express that there is additional information for consultation about any of the overarching themes; only the most relevant ideas and authors were included. In attempting to

locate doctoral (and masters) dissertations relevant to this topic, only tangential topics were found, with topics ranging from the use of aerial photography to track change in landscapes (above the water), a brief introduction of several sites from an historic perspective, and discussions of pre-inundation excavation reports (*see* Cunliffe 2013; Wyskup 2006; Dragomir 2009). Other potentially important sources of information are simply unavailable.<sup>13</sup>

The sources and concepts introduced and discussed in this review have come from a variety of sources, spanning over a century of archaeological and resource management ideas. Their contributions and shortcomings form the basis for this dissertation, centered around what this work suggests are the primary themes and ‘gaps’ in the currently available literature.

#### Closing the Literary Gap

All of the sources point largely to the following key indications, which set the stage for the remainder of this doctoral dissertation:

- Archaeological resources in freshwater can and do often endure submergence; evidence of this phenomenon is present throughout freshwater archaeology
- Deterioration of resources is concentrated to the draw-down zone, and when resources are removed (excavated) for conservation. This is two-fold: Firstly, the resources are at expedited risk of deterioration. Secondly, past attempts at good excavation in to-be flood zones were generally ill-conceived, parochial in nature, and although some

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<sup>13</sup> e.g. Harold Hauptman, primary German researcher at the Keban Reservoir never published any his findings, nor did his team of colleagues and student researchers.

archaeology was saved (e.g. Philae Temple, Egypt), post excavation analysis and dissemination of information was poor or non-existent

- While policy exists in several western countries to handle each step of the dam/reservoir development process, most notably the US and UK, there is an overwhelming lack of international policy, general awareness, and a lack of well disseminated information about conditions in reservoirs that would damage or preserve resources across the globe
- Efforts at understanding archaeological resources in reservoirs have been limited due to preconceived notions about related costs, effort involved, and presumed lack of feature-existence; most efforts have focused on pre-inundation survey, rather than post-inundation survey and monitoring works
- Most literature discussing archaeological resources in reservoirs wrongly revolves around the concept that resources will ‘be irreparably’ damaged or lost to generations worth of archaeologists (and the public), thereby causing a breach of human rights and motivation for stalling the development of future dams

Despite these themes and their related shortcomings, all of these works have played a vital role in bringing archaeological theory, methodology, policy and management to its current state. The works of Muckelroy cannot undergo substitution in providing even a basic understanding of the shifts and equilibriums of underwater sites. Nor can the works of underwater archaeologists in Scotland be ignored, since all of the fieldwork undertaken for this dissertation is based in Scottish

reservoirs. The theoretical underpinnings of archaeological heritage management and what that heritage means at the policy and international levels form a primary component in *how* this work approaches the idea of heritage, and delivers a discussion of those different approaches. These issues will become apparent and topical again, in section 4 during the analysis of national policies and programs. Finally, discussion surrounding the forms of conservation and preservation is a necessary element in the discussion of how, why and what took place during the surveys and excavations at the case study sites.

Although occasionally criticized, none of the current literature included in this review is in itself flawed or unequivocally lacking in well-founded information and good intent. All literature can be construed as missing bits of vital information about something; a medical dictionary cannot contain definitions of traditional botanical medicines. However, all good research bases itself upon other good research. It is the researcher's task to unpick the good research from the irrelevant, and form new and meaningful insight about a topic just a few degrees off the original. In this way this dissertation will base new data, synthesized findings and a fresh analysis of current policies on this existent research; creating a piece of work that is original and contributive to the substantial base upon which it rests.

The simple assertion that archaeological resources can and do survive in reservoirs and that current policy practices across the board do not reflect this paradigm is not enough. What follows from this review is the proposed methodology upon which this work and the work's validity will rely.

## **CHAPTER 3: METHODOLOGY**

This research utilizes a multifaceted methodological approach. It includes the analysis of national policy of each reservoir or subset of reservoirs, field and photographic analysis of a post-inundation site in the United States, the desk-based analysis of ancient structures in Egypt that underwent periods of rapid inundation and drying, and the underwater investigation of archaeological features in reservoirs located in Scotland. Through the study of these varied aspects and types of archaeology found in reservoirs, this project will have concluded the most in-depth and varied principal investigation of reservoir archaeology since the 1981 NRIS; the difference and contribution of this project stemming from not only the varied approaches at understanding, but also the inclusion of transnational case studies. The details of each of the methodological approaches presented in this section, in detail, also provide the motivating factors behind the decision to incorporate so many methods. Multidisciplinary methods contribute to a research framework and result that is efficient, rigorous, broadly considered and justifiable, thereby developing this dissertation into a sound foundation upon which future inquiries into this topic can rest. The methodology begins with those methods applied across all of the case studies (e.g. policy analysis), before moving on to discuss case study-specific methodologies.

### **3.1 Policy Analysis**

One of the centrally utilized approaches in this project is policy analysis, which is the process of deconstructing a problem and the various options available to address (and hopefully mitigate) it. This approach aimed determines not only the

various policies that will elicit a given set of goals, but also to provide a basis for the evaluation of the relationship between the problem, the goals, and the policies apparent. Policy analysis is broken down into a two-fold approach for active change: analysis *for* policy, and the analysis *of* policy. The analysis for policy is prescriptive, formulating policies and proposals from the ground up. The analysis of policy is reflexive. It attempts to explain the catalyst behind policy and how it developed. This latter approach is utilized through the sections of this dissertation that evaluate national policies aimed at submerged heritage, thereby providing evaluation, as well as historical context and impetus for specific policies over others.

The overall framework of this doctoral work follows on models from the former type of policy analysis: the analysis *for* policy. Analysis for policy is consecrated in three further disassembled approaches: analycentric, policy process, and meta-policy. Analycentric approaches focus on an individual problem and its solution. This work fulfills this approach's definition; the problem of archaeology in reservoirs initially seems to be the 'problem', and the various chapters comprising this dissertation contribute ever further toward a unique 'solution'. The second approach, known as the policy process, holds the political process and stakeholders as its focal point. Policy analysis is effective through its principled approach at bringing together as many stakeholders' concerns as possible, and allowing new, innovative solutions to become apparent; in essence, redistributing the structures and struggles of power between primary and tertiary groups. In this sense, this doctoral work also fits into the policy approach, in that the work and funding of so many archaeological excavations and the heated mass media messages must be called into question. Uncertainty in this author remains, as to whether this requires an alteration



of power relationships, or rather, the questioning of motivating ethics on all sides. The final approach is the meta-policy approach, which seeks to explain contextualizing factors and systems in the entire policy process; problems are illuminated which may be the result of structural factors, thus a solution under this approach's methods may entail the complete overhaul of the structure, in its unique entirety. Thus, the final meta-policy approach is also apparent in this methodology in that the problems within archaeology, development, and policy processes are flagged and targeted for change and overhaul.

Since the doctoral dissertation has a tendency for use and viewing solely within academia, the actual change implemented by this high level research is not applied in the "real world" as often as it could. As the dissertation takes extra work to make it a publishable and more easily digestible piece of work (Kammler 2008), it stands to reason that additional work and consideration on the part of the author/researcher is also needed to make it ready for review or implementation into a larger policy and organization framework. In this sense, additional works must be undertaken to actually *effect* change at the policy level. Regardless of post-doctoral works needed to make this dissertation policy-ready, this work will follow the rational model of policy analysis, formulated originally by Herbert Simon (1976). He provides a step-by-step outline of this process, as follows:

1. Intelligence gathering
2. Identifying problems
3. Assessing the consequences of all options
4. Relating consequences to values
5. Choosing the preferred option (Simon 1976)

Although Simon was the winner of the prestigious Turing Award and Nobel Prize<sup>14</sup> this process is not perfect for use in the public sector. Criticism of this approach is that the “rational model” deals predominantly with facts (steps 1-3), leaving the assessment of values to step 5, while choosing the preferred option. In 1986, Simon’s “Rational Model” received a policy facelift by political scientists Patton and Sawicki (1986: 17), who reconceived and summarized the model, provide it succinctly in the following steps:

1. Defining the problem by analyzing the data and information gathered
2. Identifying the decision criteria that will be important in solving the problem
3. A brief list of alternatives; these could succeed in solving the problem
4. Critical analysis and evaluation of each criterion is brought through, including all strengths and weaknesses
5. Decision makers evaluate each alternative and select the preferred option
6. Policy is brought through.

Despite this revised “rational model” and its successes, there remains criticism. Critics claim that the model is impractical, and based too heavily on unrealistic assumptions (Monning 2001; Matland 1995). It is, in fact, difficult to apply this model to some instances in the public sector. These problems diminish neither its effectiveness, nor application though (Sutton 1999; Schulz 2007; Dowding 1995). Rather, analysts must take every precaution to define quantifications into account from the beginning of the analysis. The “rational model” is a working model, and future revisions may prove more effective at addressing changing social and cultural values and norms. Factors for consideration in this model include

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<sup>14</sup> Economics, 1978

economic efficiency, social/cultural acceptability, operational practicality (addressing both legality and any uncertainties), and archaeological viability.

This work in its entirety is, in essence, the analysis of policy although it is an archaeological work. It also contains a chapter based solely on and of policy analyses. Rather than continuing through all of the steps, 1-6, this project relies on steps 1-4. The following table charts out all of the steps in this project, referring back to both the policy stages, as well as how data is acquired and how it can be useful in the future.

Policy Stage	Methodological Application	Acquisition of Data & Usage
Defining the problem by analyzing the data and information gathered	<ul style="list-style-type: none"> <li>-Gather information from all of the methods utilised in this dissertation (fieldwork, desk based assessment, policy analysis, photography, etc)</li> <li>-Use first hand accounts of archaeological features' damage/preservation</li> <li>-Record and analyze data collected from reservoirs and policy analysis</li> </ul>	<ul style="list-style-type: none"> <li>-National Legislation Records (online &amp; print)</li> <li>-Self-obtained data through fieldwork, visitation and photography</li> <li>-First hand accounts of Philae Temple in Egypt (print)</li> </ul>
Identifying the decision criteria that will be important in solving the problem	<ul style="list-style-type: none"> <li>-Evaluate the effect of reservoirs on archaeology in various zones (water column) through the comparative analysis of their relative conditions at different points of submergence</li> <li>-Weigh actual affect (quantitative) against presumed affect</li> <li>-Evaluate individual national policy for apparent impetus to its creation</li> <li>-Begin to analyze cost-benefit analysis of dams vs. archaeology</li> </ul>	<ul style="list-style-type: none"> <li>-Evaluative analysis</li> <li>-Product of this body of work</li> <li>-Creation of arguments <i>and</i> factual data for future policy and archaeological management application</li> </ul>
A brief list of alternatives that could succeed in solving the problem	<ul style="list-style-type: none"> <li>-Continue flooding/submerging</li> <li>-Mitigate damage through excavation (or minimally, recording/surveying)</li> <li>-Mitigate through <i>in situ</i> protection and conservation measures</li> <li>-Provide better monitoring</li> </ul>	<ul style="list-style-type: none"> <li>-Alternatives created based on research and realistic options</li> </ul>
Critical analysis and evaluation of each criterion, including strengths and weaknesses	<ul style="list-style-type: none"> <li>-Do case studies hold validity in all settings and what evidence suggests this?</li> <li>-Will better monitoring cost more than initial excavation? (But is it more effective and ethical in the long-term?)</li> <li>-How can national policies improve? Is less sometimes more? Or is more research needed?</li> <li>-What aspects of damage or loss have not been considered?</li> </ul>	<ul style="list-style-type: none"> <li>-Reflection and evaluation of body of work</li> <li>-Provides legitimacy and creates space for dialogue into future pursuits, improvement of this (and future) works</li> <li>-Can be dissected and published towards implementation of changes</li> </ul>

## 3.2 Photography

The use of policy analysis is only one of four different facets of methodologies employed in this project. Good photographic evidence collection is key and plays a prominent role in the rest of this dissertation. As such, a means for that collection needs addressing. The first method of data collection mentioned above is photography, and it was used both on land to assess potential damage of the now dry and formerly submerged town of St. Thomas, NV and underwater to capture images of a variety of archaeological sites in Scottish reservoirs. There are both advantages and disadvantages to the use of photography; i.e. underwater photography can prove difficult if suspended particulates ‘bounce’ the flash back into the image. Under these circumstances, photography proves futile. The image simply does not turn out as anything more than a hazy spectrum of sepia tones. However, what warrants discussion here are not only the advantages and disadvantages of photography, but exactly how it is used and if it is a legitimate form of data collection.

Wooliscroft (2011: 1) suggests that photography has

“...been fundamental to archaeology since at least the late 19th-century and it is still one of our principal means of primary data gathering. Indeed, in certain branches of archaeology, such as aerial work, the photographic record can represent the dominant, or even sole, source of data. Its value often lies in the fact that it produces, in as much as is possible, an objective pictorial record, whereas secondary illustrative techniques, such as plan and section drawings, at best involve an element of (possibly mistaken) interpretation and, at worst, are open to subconscious or even deliberate falsification.”

If photography has comprised one of the key methods through which to gather and keep records about archaeological sites, it also stands to reason that this method is also valuable as a source for interpreting sites and monitoring changes. Great works undertaken around the world have used aerial photography as the full basis of monitoring and research (e.g. Cunliffe's recording of culturally sensitive sites in Syria in 2012, or the California Coastal Records Project in 2010). Although aerial photography in particular has come to the foreground in recent years, owing in no small part to the great availability of it through Google Earth and in easily accessible collections, all manner of photography are fit for interpretation, data collection and records maintenance. Indeed, English Heritage (2012) reports that photographs "...can be used, either on their own, or together with other techniques, to investigate entire landscapes, feed into multi-disciplinary projects and directly improve the management of the historic environment."

This project uses photographs in all of these ways, in each direct case study. In the case of the temples at Philae, Egypt, early photographs are used for juxtaposition against more recent photographs. At St. Thomas, Nevada, few photographs were taken pre-inundation and so the photographs are used for actual data recording (height, width, scatter and visible damage to structures), rather than comparison. Finally, in the case of the variety of sites surveyed in Scottish reservoirs, photographs are used to compare sites from the spring season of 2012, to photographs taken of those same sites a decade earlier. In the event of sites not photographed previously, these will provide a general record of the feature and a means through which future monitoring can take place. Advancing the use of photography a step beyond traditional focus-shoot, this project also makes use of

underwater videography (for records) and the extraction of still from those videos in order to form a very large, comprehensive photomosaic of the cross-sections of large features.

The physical photographic methodology used throughout this project varies from case study to case study. The time frames implicit in the case studies, as well as the difference in environment, necessitate different approaches to the act of taking photographs. All of the photos taken within the period from 2008-2012 are from a Canon digital IXUS 9515, at 10.0 mega pixels. The Canon camera was provided an underwater housing and external flash by Ikelite. No zoom functions were utilized in either underwater or ground photos. All images were recorded to SD card, before upload into iPhoto and ultimately Adobe CS5 for resizing, formation of photomosaics, and processing. The scale of photographs change, but scales or scale references are provided throughout.

Ground photos (land based) were personally taken at the site of St. Thomas, from a variety of distances and angles in order to give the best view of structures and structural foundations. Due to the status of the park in which the town now sits, no archaeological implements were permitted, including ranging rods. Photographic survey was planned on the basis of comparative photos available through the National Parks Service and the research conducted by Wyskup (2006). Therefore, photographic evidence from St. Thomas is only one part of the evaluation of damage to structures. Throughout the underwater photography process of the fieldwork in Scottish reservoirs, scales were used whenever possible. In the event of such poor visibility that scales could not be used, one scale photo was taken at the onset, with following images at the same distance from features, with these images forming a

larger photomosaic. Distances between photographer/diver and features underwater varied between 1 metre and 4 metres.

Photography, whether utilized on land or in the water, provides a unique and nearly objective component to the analysis of the state of archaeological features, assuming no tampering (digital alteration) takes place. In this project, the collection of first hand photographs is only the first step in gathering data. The second step involves correlating the state of the archaeological feature to its location and time in the reservoir. To do this, other photographs or records must exist with which to juxtapose these newer images. The photographs were compared against the original building pictures, plans of the town (made at the time of the demolition) and subjective analysis of their appearance. Other first hand accounts of the town were taken into account, in addition to the doctoral works of others on this site. Photographs taken underwater of features in reservoirs were juxtaposed against the photographs taken by Tam Ward and the Biggar Archaeology Group from periods of low water, in the draw down zone. For those features deeper than the draw down zone, and thus out of the reach of the Biggar archaeologists, old records of the features come to the aid for comparative purposes. These old records are in addition to the aerial photographs provided by Google Earth Professional, the Royal Commission on the Ancient and Historic Monuments of Scotland (RCAHMS), Ordnance Survey maps, and the plans, maps and photographs provided by the Perth & Kinross Heritage Trust.

### **3.3 Desk Based Assessment**

All of the sites studied underwent archaeological desk based assessment (DBA) before further investigation, or as the sole means of understanding the

complex narrative of the site and if it has been changed by the creation of the reservoir. DBA standards are well set and documented by the Chartered Institute of Field Archaeologists (CIfA), which sets the following areas of investigative potential when tackling issues surrounding a site through the use of the DBA (Gurney 2003, 9; CIFA 2014):

- Report of a site visit (compulsory)
- Sites and Monuments Record or Historic Environment Record (if applicable)
- Available historic maps (compulsory)
- Geological maps
- Ordnance Survey maps of the site and its environs
- Tithe apportionment, enclosure and parish maps
- Estate maps
- Documentary and cartographic collections held by the relevant record office
- Local Studies libraries
- Historical documents held in other record offices, local museums, libraries or other archives
- Enrolled deeds
- Archaeological and historical books and journals
- Unpublished research reports and archives held by relevant museums, local societies and archaeological contractors and consultants
- All sources of aerial photography, including the National Monuments Record and the Cambridge University Collection of Aerial Photographs (see below)
- Borehole and trial pit data
- Geophysical and/or geotechnical data.



The purpose of the DBA is to establish, as far as reasonably possible, the extent, nature and significance of the historic environment or archaeological feature (CI/A 2014). Although this advice is written for the undertaking of what is generally commercially-based desk assessments, it is also valid for the comprehensive assessment of sites for academic purposes for it is clear, thorough and a well-established part of the industry standards of compliance.

Use of the DBA was deemed essential for analysing sites in the UK, the USA and Egypt. It established photographic and other documentary evidence about the conditions of the sites, as well as created a portfolio of reference materials for cross-referencing. In the case of Egypt specifically, DBA was the only means of assessing the potential damages at Philae, since travel to Egypt became impossible during the Arab Spring. All of the sites, therefore, underwent the DBA process, with critical analysis of cross-sections of the DBA constructed in the case of the sites associated with Philae, and physical investigations (i.e. photography, survey, etc.) of the sites at Lake Mead and in the reservoirs in Scotland.

The sources studied for each case studied differed, based on the availability of documentary evidence. In the case of Philae, Egypt, historical documents, maps, illustration plates, black and white photographs paired with modern aerial maps and photographs, taken from both above and at street-view. Egyptian records were consulted, along with basic geologic and environmental information directly related to the case study area limits. Lake Mead had similar documentation available, and the materials consulted included books, historic documents, photographs, aerial photography, maps, on-site photography and other researchers' accounts of St. Thomas, Nevada. The DBA, in this case, was followed up by a site visit that

included a walk over survey and photography. The final case study, that which centred around a variety of sites and in assorted reservoirs in Scotland, included many of the same records searches and analysis. Aerial photographs, historic maps (including OS maps), archaeology records, and historic documents paired with first hand accounts of the sites, photographs, site plans and recent site records, and was followed by an in depth, underwater survey. However, in all cases, the DBA came first with decisions about the nature and extent of survey or further analysis made based on the quality and quantity of information available.

### **3.4 Walkover survey**

Walkover surveys were conducted after desk based assessments were completed on the sites in Scottish Reservoirs and in Lake Mead. Little was visible of the sites in Scotland since they were fully submerged. However, in the case of Lake Mead, walk over survey was the only viable option, paired with photography. Walkover survey is a rapid means of assessing the upstanding archaeology and built structures of large or inaccessible areas, such as woodland. It comprises systematically walking over a given area in order to plot and/or assess the condition of features, and is a standard practice in field archaeology methodology, used in both coastal zone assessments (see Brady & Morris 1998) and site stability investigations (see Greenwood, Norris & Wint 2006). In this case, it followed the basic methodological approach suggested by Hogg (1980, 275) for "rough survey" substituting formal drawings for rough sketches of features, paired with photographs taken with the aim of later cross-comparison. The aim was to view all upstanding structures and remnants of structures in a relatively short period, and assess their

overall condition. The walkover survey also provided the opportunity to take photographs both of structures noted in the Wyskup report and other features not in the Wyskup report but were nonetheless noticed during the walkover survey (e.g. fences and fence lines, trees, rubble, etc.).

Greenwood, Norris and Wint (2006) utilised walkover survey to examine the effects of vegetation on ground stability, and it was hoped that the walkover survey undertaken at Lake Mead would also answer ground stability questions related to the overgrowth of Tamarisk throughout St. Thomas, as well as stability of the actual structural remains of features. At St. Thomas, the walkover survey would take the place of any formal excavation or intrusive investigation, which was deemed wholly unnecessary, given the research aims of determining rates of deterioration rather than discovery of new sites or materials.

### **3.5 Underwater Fieldwork**

Underwater archaeological fieldwork was the tool through which surveys, photography and drawings were completed in the Scottish reservoirs. Non-invasive survey was chosen on the basis of the need to record that which was visible and exposed, rather than performing excavation works that would further expose potentially vulnerable features and lead to the added tasks and costs associated with post-excavation analysis, conservation and storage.

Due to seasonal and demand-based fluctuations in reservoir water levels, it was possible to conduct archaeological site assessments at different intervals when water was lower, thereby allowing walkover survey. However, the author deemed it necessary to conduct fieldwork in Scotland wholly underwater due to budgetary and

volunteer constraints. The varying locations of features within the water column also become a concern, being inaccessible, regardless of time of year or water level. Therefore, the underwater fieldwork became a holistic and applied method in all of the reservoirs, proving to the general research community that work in reservoirs, underwater, should not be dismissed as a viable option, even when the water level is high. The resultant data from these weeks of reservoir diving remain testament that accurate records are obtainable from features, regardless of their state of preservation.

The actual physical act of diving in reservoirs was undertaken with utmost care and attention to the state of volunteer divers and to maintaining all equipment and records on site. Site risk assessments were created on a reservoir-by-reservoir basis, and received pre-dive approval from the University of Edinburgh and Scottish Water. The team that was assembled to retrieve and record data consisted of two-dozen volunteers (not a predetermined figure), who were all required to have a minimum of ten cold-water dives, be drysuit and minimally “rescue diver” qualified, and have some peripheral knowledge or experience of underwater archaeology<sup>15</sup>. A daily run through of the day’s coming dives and dive objectives, water and weather information, and a reminder of safe dive and best practice of archaeological methodology occurred at the start of each dive day. Training in how to use the archaeological recording forms took place in the day before diving in each reservoir. This training provided continuity and quality assurance as teams of diver rotated between dives and weeks, per their availability.

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<sup>15</sup> Special permission was granted to several students to use this fieldwork experience toward their Nautical Archaeology Society course & experience requirements; see "CALL FOR VOLUNTEERS" for the text of the advert that was placed on BAJR and other websites, and "INFO" for the brochure/booklet that was mailed to each in advance of their arrival.

Actual underwater dive plans, drawn up on the basis of the Recreational Dive Planner, as approved and utilized by the Nautical Archaeology Society (NAS) were written up in advance of dive days. The first step in creating dive plans was to set a firm schedule of events per dive sequence, timed down to the minute. First, volunteers on the surface used surface-use GPS locators to determine the approximate location of the archaeological feature, upon which a buoy would be dropped. If this feature was within 100m of the shoreline, divers dropped this by hand. If the feature veered into waters greater than 100m from the shoreline, a non-motorized row boat, suitable for up to 5 people, was used for both location and buoy demarcation. After demarcation, a fresh team of divers entered the water. The initial descent to a potential feature was also always the same: divers descended down the line to the reservoir floor and began searching for evidence of the feature with torches lit, by making a circular search pattern out from the primary buoy line. Each circle around the line ended by the range of the search increasing by two metres. Location was normally within a ten-metre radius from the initial GPS point, and a new SMB was inflated and released to the surface, thereby marking the correct point. In the event of no GPS data, Ordnance Maps were used in coordination with any other existing aerial photographs, and the feature location was triangulated first on the map, and then by eye in the water. Divers descended approximately 30 m from the eyed location, and used a U-pattern dive search (figure 3) to attempt to relocate the feature.

Divers assembled in four teams of two on a daily basis, in order to start the dive Rota. One team entered the water at any given point, with another team equipped at the water's edge in case of an emergency. Any more divers in the

water at once would unnecessarily stir up the fine silts on the bottom of the reservoir, a discovery made during pre-CSF test dives. Having the rescue team at the ready also made between dive transitions quicker, allowing ‘dry’ teams to assist the exiting team to remove heavy, wet dive equipment, as another ‘dry’ team suited up to take their role of rescue team, and the rescue team entered the water to begin the swim out to the marker buoy (figure 4).

Dive durations were limited to 30 minutes, including bottom to surface time, in order to maximize diver safety in regards to safe decompression limits<sup>16</sup> and water temperature, which varied between 2 and 8°C. To maintain high dive safety standards, dive equipment was regulated to minimums. Safe, but minimal quantities of equipment on each diver was required. Trimming dive equipment essentials back to minimums increased diver safety (by minimizing dragging hoses or carabineer clips), and allowed for universality of each individual diver’s personal equipment. In the event of an emergency, each diver would expect to find the exact same equipment in the exact same places. Required equipment included:

- Dry suit
- Dive mask & snorkel
- Boots, hood and gloves
- Dive knife
- Single scuba cylinder (compressed air only, no nitrogen or mixed gases)
- Standard buoyancy control device (BCD)
- Regulator, with addition octopus
- Weight belt or integrated weight system, and weights
- Functioning analog compass
- Dive watch/dive computers and/or a set of slate dive tables (US Navy Tables)
- Dive notepad or slate fitted with permatrace, for recording

All divers involved in fieldwork dived in pairs, with an additional rescue diver fully suited and water-ready at the surface, one diver tender/assistant to assist

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<sup>16</sup> Based on US Navy Divetables & the Recreational Dive Planner for non-decompression dives, diving on regular, compressed air (no gas mixes of any type).

in prepping divers and assisting them into and out of the water, and one qualified dive site supervisor.

Surveys of features were taken using a 32 metre baseline, that was consistently centred over the feature (as closely as possible), stretching from north to south. All measurements were triangulated from this baseline, with video footage taken along the baseline where possible. Consistency in baselines was essential in order to best align features with those surveyed by BAG.

### **3.6 Archaeological Recording Forms and Resultant Numbers**

In order to determine any potential rate of change, degradation or stability, a system through which divers could easily label or indicate their findings was required; so, too, was a system needed for the researcher to assess findings during the post-field work phase, when comparisons between drawings, photographs, etc. would be made. The methodology used in assessing changes and rates of degradation is a conglomeration of several types of established field survey methodology in ecology and sustainability studies (Krebs 1999; Hauer and Lamberti 2007; and Wersal, Madsen & Cheshier 2010). To accommodate both requirements, a document was created that allowed easy training and recording of archaeological damage. It was based most predominantly on the archaeological damage assessment sheet used by the SCAPE Trust in their Coastal Zone Assessment Surveys (Sneddon 2003), and the system of matrices and numbers utilized by Muckelroy (1977, 51) in his assessment of historic wrecks in Britain. The areas divers were grading features was based on the actual physicality of reservoirs and Muckelroy's (1997, 51) list of environmental attributes. The final set of attributes included:

1. Construction material
2. Construction method (affixing)

3. Depth in the reservoir
4. Proximity to the dam
5. Proximity to key channels and currents
6. Disturbance to the site (movement of its construction materials)
7. Visible amount of erosion
8. Floral growth
9. Annual temperature variation.

Each of these attributes used a system of grading, easy to read and use in the water and straightforward to use during the post-fieldwork phase. For consistency, both the divers and I used the same recording sheets.

The environmental and spatial attributes listed above were graded on a scale of 0-6, with zero equaling in all cases the least possible change that was visible or having the least possible effect on the feature. A marking of 6 indicated the greatest possible effect on the feature. Table 1 shows the breakdown of environmental attributes and how the numeric scales indicated a set of graded changes for each category.

**Table 1 Nine environmental attributes with numeric values for impacting factors, Stammitti 2011**

<b>Construction Material</b>	<b>Number:</b>		5- 2+m plus scatter
	0- Stone		6- Scatter immeasurable
	1- Brick	<b>Erosion</b>	<b>Number:</b>
	2- Concrete		0- less than 0.01m
	3- Metal		1- 0.01-0.02m
	4- Wood		2- 0.02-0.05m
	5- Mounded Soil		3- 0.05-.1m
	6- Level Soil		4- .1-.25m
<b>Construction Method</b>	<b>Number:</b>		5- .25-.5m
	0- Cemented		6- Feature indistinct
	1- Mortared	<b>Floral Growth</b>	<b>Number:</b>
	2- Tight packed		0- No growth noted
	3- Loose packed		1- Small algal growth
	4- Nailed		2- Large amount of algal growth
	5- Mounded & packed		3- Algal growth and grasses present
	6- Dug into natural		4- Algae & grasses cover feature
<b>Depth in Reservoir</b>	<b>Number:</b>		5- Heavy floral growth
	0- 38+ meters		6- Overgrowth; feature indistinct
	1- 20-38 meters	<b>Annual Temperature variation</b>	<b>Number:</b>
	2- 12-20 meters		0- <1°C
	3- 6-12 meters		1- 1-2°C
	4- 4-6 meters		2- 2-4°C
	5- 1-4 meters		3- 4-6°C
	6- 0-1 meters		4- 6-8°C
<b>Proximity to Dam</b>	<b>Number:</b>		5- 8-10°C
	0- <500 meters		6- 10°C+ variation
	1- 500-750 m		
	2- 750-1000 m		
	3- 1km-1.5km		
	4- 1.5-2km		
	5- 2-2.5km		
	6- >2.5km		
<b>Proximity to key channels</b>	<b>Number:</b>		
	0- Deep in reservoir		
	1- In lee area (>90° angle)		
	2- In lee area (<90° angle)		
	3- Within main body of reservoir		
	4- Within key channel		
	5- Within draw-down zone		
	6- In top 1m of draw down zone		
<b>Site Redistribution</b>	<b>Number:</b>		
	0- Less than 0.05m		
	1- 0.05-.25m		
	2- .25-.5m		
	3- .5-1m		
	4- 1-2m		



The ratings of each numeric value (e.g. 0 = stone, 1 = brick, etc.) were based on Muckelroy's 1977 matrix model for valuing potential change, and care was taken to adhere to his system of gradation as much as possible, though some categories were original to this work. The form used in this fieldwork deviated from the system of Muckelroy's matrices that utilised the Kendall Rank Correlation Coefficient system, in that each feature was scored on the basis of its own condition, rather than being scored comparatively against other features (Muckelroy 1977, 51). The SCAPE Trust's archaeological site assessment recording form (Sneddon 2003, 261) was also taken into consideration when creating this system for valuing and marking, contributing a physical layout that was easy for divers to read when in the water, and the notion that a day of training for continuity and quality assurance was accomplished throughout the process. Therefore, a day of training, similar to the SCAPE Trust's outreach and training day (Sneddon 2003, 10) was implemented to take place on days before diving began.

Divers were not always able to mark all features in all categories, since annual temperature variation was not a visible category. In this case, they were instructed to leave these blank, and these blanks were filled in by the doctoral researcher in the post-fieldwork phase. After each question was answered and the corresponding numbers added up, out of 54 total (9 environmental attributes, with a maximum of a score of 6), the features were plotted on a graph against each other, and it is within these final comparisons that data emerged. It provides clear assessment data for each individual site, while also providing comparative data to determine if there was a correlation between rates of change on the basis of the environ-spatial factors (i.e. location, typology, etc.). These plotted comparisons

included those against features in the same reservoir, in the same typology (e.g. stone features against stone features), and overall, in order to define those attributes, geographical locations and characteristics that were having the most profound affect. Only by understanding the full extent of site degradation on the basis of sets of characteristics, can better prioritization and long term monitoring, through better policy, emerge.

### 3.7 Interviews

The author also set out to interview one or more employees of the National Park Service, Historic Scotland, Royal Commission on the Ancient and Historic Monuments of Scotland, and from the dam industry more generally. At the outset of the research, there was no formal interview questionnaire pack. Instead, the questions generated at interviews were due to developments in the research and the sets of questions were individually created for each unique person based on their own relationship with dams, reservoirs and archaeological resource management.

Interview question formatting was based on the categorical labeling suggested by Ritchie & Spencer (1994, 175) that broke questioning down into groups of four possibilities:

1. Contextual: those questions that identify the nature and form of what exists
2. Diagnostic: those questions that examine the reasons for or causes of what exists
3. Evaluative: those questions that appraise the value of what exists
4. Strategic: those questions that identify new theories, policies, plans, or actions

By attempting to create answers to all of these types of questions when holding interviews with such a broad group of individuals, Ritchie and Spencer suggest the greatest illumination or understanding of the issues being addressed

comes to the fore (1994, 176). Interviews were held in an attempt to find associations between the different systems, countries and agencies involved in the dam development and archaeological management process at many bureaucratic levels, to seek explanations for why things occur as they do, and to help develop new ideas about policy intervention methods and their practicality.

### **3.8 Specific Case Studies**

#### Case Study: Philae

In analyzing individual cases, photography alone does not necessarily prove adequate. At Philae, photographic evidence is only one part of the equation. Understanding and evaluating the changes that have taken place at Philae, as well as analyzing why this site was completely relocated during the UNESCO Campaign to Relocate the Monuments of Ancient Egypt, cannot come to fruition through photographs alone. Thus, this case study evaluates the surrounding national policy as well as the greater international movement to relocate it. It also assesses the first hand account of the temple's condition after the raising of the Aswan Dam (Aswan Low Dam). During the years following the completion of the Aswan Low Dam, a series of intensive studies, undertaken to ascertain damages and potential damages to the temples, took place. This was meant to create a "snapshot" of a the monuments since the Egyptians were already considering the construction of a newer, higher dam at Aswan. Firsthand accounts were taken, in addition to scale-drawings, plans for the potential relocation of the structure(s), pH analysis and early photographs. The temples at Philae were among the first scientifically recorded with the aim of broadening the understanding the impact of reservoirs on archaeological resources, even if in this specific incident the studies were to examine how well the temple

structures could withstand current and future flooding events. The results of this study will be discussed later, in the chapter dedicated to Philae's unique circumstances. Given the politics surrounding this case, the volume of information and primary sources available, it is considered an important part of this unique case study's argument that reservoirs do not always damage archaeological resources. Rather, archaeological resources are sometimes used as a platform for other nationalistic and financial motivations, often casting the reservoir in the primary damage-doing role and the archaeologist as the savior of the past, and the liaison between history and politics.

#### Case Study: St. Thomas

The site of St. Thomas, Nevada was also chosen as a case study for this project as it was accessible, in a terrain unlike that of Scotland or Egypt, and was located in the United States: the home of the NRIS, which features as a prominent piece of literature in this project, as well as in the greater sphere of submerged archaeology. The waters of Lake Mead covered St. Thomas, located in the shadow of the Hoover Dam, for half a century. The town, once a moderate sized Mormon settlement, was evacuated prior to the flooding of the dam that would slow and backfill the Colorado River, turning it into Lake Mead. Buildings were planned and then methodically demolished. It was largely assumed by inhabitants of St. Thomas, and dam engineers, that the town would never be seen again. However, years of drought in the Southwestern United States caused the water levels of Lake Mead to fluctuate and ultimately drop by more than 21 metres, so that in 2008, St. Thomas emerged from the silty bottom of the reservoir. Resting on arid desert land once again, St. Thomas has come under investigation and control of the National Park

Service, as well as becoming the topic of two doctoral dissertations at the University of Nevada at Las Vegas (Wyskup, 2010; McArthur, 2011; United States Bureau of Land Management and National Park Service, 2008).

St. Thomas proves a vital role in this dissertation for several reasons of equal weight. First, the entire town was flooded in a non-draw down zone, so was essentially an underwater archaeological site for over 50 years, in a limnological environment. The site is now completely, and potentially permanently, dry and resting in its original local and dry environment on the outskirts of the Colorado River Basin. Easily accessible, submerged archaeological sites are available for study. Of these known submerged archaeological resources, even fewer have undergone more than a half century worth of submergence, and are now accessible on land for even easier ease of access (versus submergence and SCUBA access). In essence, St. Thomas provides an optimal setting for the study and understanding of the long term effects of submergence on other sites; it is located in an extreme setting, in that it has wavered between arid and completely submerged and arid again, compared with sites which vary only between damp and wet environs, such as those studied in the fieldwork component of this dissertation. Cumulative results from the St. Thomas analysis will reveal whether this setting is beneficial to the preservation of the site, or damaging. Furthermore, this analysis will reveal whether archaeological sites in other zones, deeper in reservoirs (below the draw down zone), will sustain damage or remain generally unharmed and with potential for remaining archaeological value and data once they, too, emerge from drained reservoirs at the end of a dam's life expectancy.

## Case Study: Scotland (6 Reservoirs)

A variety of reservoirs, as well as types of features, were chosen to assist in creating sounder, more varied first hand data retrieval. The reservoirs investigated in Scotland was limited to three geographic regions: the Scottish Borders, South Lanarkshire, and Perth & Kinross. This geographic constraint to Scotland (rather than on mainland Europe) was intentional, reflecting the need for reservoirs that were distinctly different from those involved in the other two case studies (arid desert environments). Other factors involved in this choosing included proximity operational dive centres and emergency services, a tight budget, United Kingdom HSE and insurance limitations, and meeting the housing needs for a group of volunteer divers.

The methodologies employed involved photography, as discussed above, measuring and drawing to scale, taking video footage (for posterity and generating photomosaics) and establishing the reliability of the GPS data that is currently on record. Surveying and photographing sites *in situ* while the reservoir waters are still above the level of the sites gives an accurate cross-section of data about the site for juxtaposition against survey data collected while the site was above the low water mark, or survey pre-submergence.

The initial decision to survey archaeological remains in Scottish reservoirs, specifically, was not undertaken lightly. Appropriate reservoirs were needed, and over a six-month period several dozen reservoirs were scrutinized for a variety of factors. All of the chosen reservoirs needed road access and known archaeological remains. Visibility limitations in Scottish reservoirs, no matter how still the air, pose a real problem. Expert advice from four different bodies of dive knowledge

was sought<sup>17</sup>, with the addition of an on-site dive consultant, the completion of the PADI Divemaster course, and completing the rigorous process of HSE and Scottish Water Safe Diving checks<sup>18</sup>. However, just knowing archaeological remains were present was not enough, nor the completion of HSE paperwork; those remains of features needed high quality plans or pictures, if real data were to be collected. Some understanding of the local flora and [potential] fauna was also helpful, in addition to permission to access the waterway, and global positioning data (GPS) where possible, lest divers stray onto a tumble of stones and mistake them for the archaeological feature. Given very few reservoirs were surveyed prior to any type of reservoir inundation, the selection process began narrowing very quickly. The discovery of the locally run Biggar Archaeology Group (BAG), led by Tam Ward, hastened the decision process.

Tam's team of archaeologists (comprised of volunteers from the greater Biggar area) completed in depth surveys of many of the reservoirs and reservoir valleys in South Lanarkshire and the Scottish Borders. Although none of the members of the group are underwater archaeologists, Tam relied on extremely low water periods to initiate survey and excavation of archaeological features that appeared on the new shorelines, also known as the "draw down zone" of the reservoirs. The terrestrial work was carried out from 2002-2008, during periods of low water due to drought conditions in the region, which allowed archaeologists on-foot, access to a variety of features. Their preliminary results showed moderate levels of erosion and damage to many features located in the "draw down zone", with repeated calls for attention and investigation.

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<sup>17</sup> PADI, BSAC, Nautical Archaeology Society and ScotSAC

<sup>18</sup> See appendix "HSE" and "RISK" for the on-site HSE emergency paperwork and the site risk assessment each diver was required to sign.

Concurrent exchanges of dialogue also took place with the *Perth and Kinross Heritage Trust* (PKHT), under the auspices of David Strachan. The PKHT was involved in the 2003 recording of site data, when the Upper Glendevon Reservoir's water levels lowered to such a great extent that a whole new landscape of uncharted archaeological remains were exposed, thanks to the reservoir's erosion of the topsoil and natural floras. That team focused its concerted efforts, under the direction of the *Royal Commission on the Ancient and Historic Monuments of Scotland*, on investigating what appeared to be a Motte or mound, several uncovered Cairns, sheepfolds and a quick inspection of a local set of farm buildings. Therefore, the Upper Glendevon Reservoir was added to the list of reservoirs for survey. Data retrieved from drawing to scale, photographs (underwater) and all other data compiled from the fieldwork is analyzed against the data provided by the Biggar Archaeology Group, the Perth & Kinross Heritage Trust, aerial photography, and the RCAHMS.

### **3.9 Methodology results (hypothesis)**

The author hypothesizes that features in the draw-down zone that are of from the earthen typology, will undergo the most severe changes, while the remaining features in the reservoir may undergo some period of redistribution, but eventually find their own equilibrium. This assertion is opposed by Tam Ward, of the Biggar Archaeology Group, who suggests that all features in the reservoir's draw-down zone will undergo real and irreparable damage. The results of this receive discussed in Chapter 5.4.c Case Study Fieldwork and Chapter 6 Analysis, and are not intended solely to prove or disprove the commentary provided by Tam Ward and others who



have discussed archaeological features in reservoirs. The data is useful in revealing the extent of damage, how it can be managed and mitigated in the future, and how it can be used as the impetus for mid and long-term monitoring of features in reservoirs. Likewise, it is the author's hope that this work will provide enough evidence to suggest that archaeological features in reservoirs are worth hunting out, even in cases when there are no definitively known features in a reservoir (whether not recorded through neglect, lack of time or interest pre-inundation). It also attempts to give hope to those archaeologists who have worked relentlessly in reservoir flood basins to 'rescue' as much archaeology as possible pre-inundation that those unrecorded or excavated monuments, features or yet-unknown resources are still viable and undamaged for future generations of terrestrial, underwater or remote sensing archaeologists. All of this evidence is then correlated toward denoting some reservoirs as submerged landscapes, thereby reconsidering and redefining submerged landscapes as they are currently conceived of in the maritime sense.

Upon completion of the analysis of fieldwork results, case study analyses, and a broader discussion of each country's national reservoir agenda and policy, further application to the field of policy, archaeology and archaeological heritage management are discussed. Additional commentary about the prioritization of dam development processes and existing CRM awareness initiatives follows to bring discussion and the significant timeliness of this work to the fore. These analyses will bring together all of the disciplines utilized in constructing this dissertation before providing a set of policy recommendations and moving on to the concluding chapter.

## CHAPTER 4 DAMS: AN INTRODUCTION

Dams are a contentious subject, despite the rise in number of large dams around the world (Morvaridi 2005; Rowley 1993; Omar 2005). The late 20<sup>th</sup> century saw an expansion in the number of ‘large’ dams to over 40,000 and all dams, inclusive of size, to over 800,000 (International Rivers 2007). Engineers involved in the dam construction projects are quick to praise dams as the quick cure for a nation or region’s problems (from poverty to water-borne illnesses), while those in the heritage sector approach the dam issue with a combination of consternation and delight. Impending dams will flood huge tracts of land- a current global figure is over 400,000km<sup>2</sup> (International Rivers 2007), causing the inevitable flooding of a range of archaeological sites and landscapes; but the dams also bring a range of funding and publicity opportunities for those archaeological salvage teams involved in the rescue efforts.

Dams and their repercussions are complicated, no matter which argumentative stance is taken. In structure and function, they are complicated achievements of engineering, even if their purposes of irrigation and water control have remained largely unchanged for the past five thousand years. They are both feats of engineering and tremendous symbols of power, nationalism, and man’s triumph over nature. Notwithstanding calls from a variety of concerned stakeholders, ranging from ecologists to human rights activists, countries have little incentive to *not* build dams, despite concerns about their expense, impact and the relocation of populations. Nationalism requires the elaboration of a real or invented

remote past and future, and dams are utilized toward the further establishment of nationalistic feelings (Klingensmith 2007), in addition to increases in national revenues from hydropower, tourism or overall population growth (Kohl 1998). That archaeological resources may come under threat is seemingly of little overall concern to developmental regimes (De Gruchy et al 2012)), as heritage resources are still among the “soft” topics of human rights, especially as compared to irrigation, water security and renewable energy needs of populations (Hughes 2009).

Over the past century, professionals from the heritage and dam construction sectors have come together with increasing frequency toward cooperation and collaboration on large dam projects (Welsby 1998). In some cases, engineers and archaeologists have held very divergent views about how and at which point in the planning process and archaeological management needs can be addressed, but with each new dam, different approaches are attempted, some more holistically than others are. Understanding the scientific and planning process of dam projects should reflect as importantly in the heritage management’s toolbox as the attempted holistic understanding and interpretation of the flood valley’s archaeological resources, but this is not always the case (De Gruchy, et al. 2012). Nevertheless, in this chapter, a range of issues regarding dams and their associated reservoirs are discussed: an explanation of the hydrology of reservoirs and sedimentation processes, the cost-benefit approach to planning dams, the removal of archaeological resources, and an anthropological consideration are all considered.

## 4.1 Sedimentary Processes affecting Site Stability

The sedimentary processes affecting site stability are as varied as the location of sites within and along the borders of reservoirs. While there are no studies on the specific effects of sedimentary processes on archaeological sites, data about these processes and analyses thereof are prolific within the greater study of dam engineering, ecological monitoring within reservoir bodies, and estuary and riverine archaeology. Drawing broadly from these three key areas before moving into underwater archaeology's foundations and theories, predictive and quantitative assertions about the state of reservoir sites move forward.

Sedimentation within a reservoir is subject to three distinct variables: the sediment type and nutrient capacity upriver, formalized watershed management plans, and thermal stratification. Levels of sedimentation rise in a reservoir when the sediment upriver are picked up by the flow of the river waters and then either deposited further downriver, or due to thermal stratification, sediment typology or hydrological factors becomes suspended particulate (Jones 1997). In this way, reservoir sedimentation shares similarities with long-shore transport of sediments in which particles of sand, silt, or other materials are picked up and relocated by the action of waves and tidal currents, for deposition down shore as noted by Chakela (1981) and Wilkinson and McElroy (2007: 141). Sedimentation grain size can range from very small (clay and silt) to large cobble. As it takes more water flow of force to move large grains of sediment, difficulties within reservoir arise; this is due specifically to the somewhat faster water flow of rivers behind reservoirs compared with seabed archaeology. Therefore, while sedimentation at the seabed will occur over time, the rate of sedimentation will be slower and the type of sediment

finer/smaller (Muckelroy 1978; Ward et al 1999), whereas reservoir sites may be covered partially or completely with sediment of varying sizes.

Reservoir life is the expected number of years before a reservoir's dead storage fills beyond function. Heightened rates of sedimentation reduce live storage capacities and curtail power generation. Dead storage comprises all reservoir water beneath the level of the intakes for the dam's turbines; all of the water at or above this intake level is part of the live storage. Useful reservoir life is a function of dead storage and river-borne sediment loads. Useful reservoir life is a good indicator of the relative sustainability of electric power generation; it varies from less than ten years before dead storage is filled (such as the Paute Dam in Ecuador) to potentially thousands of years (Harden, 1993). Reservoirs with the longest useful life (i.e. lowest rates of sedimentation) are relatively deep and situated on rivers with low sediment loads. Maintaining low sediment loads over time typically requires good watershed management. In the real world of limited budgets, tight construction timetables, conflicting priorities, and weak implementing agencies, the ideal mitigation measures are often not carried out, even if properly planned.

For hydroelectric projects, the single most important environmental mitigation measure is good dam site selection- if it is environmentally benign, the likelihood of archaeologically benign status is good for any archaeological site within the reservoir boundaries becomes subject to the same influences as those in the surrounding environment (Ward, Larcombe, & Veth 1998; 1999). The most "environmentally benign hydroelectric dam sites are on upper tributaries, while the most problematic ones are on the large main stems of rivers" (Ledec & Quintera 2003). Not all reservoirs are subject to massive sediment retention, as demonstrated

in the study of the Mogi-Guaçu River Reservoir (Bradimarte et al. 2008). Thus it can be concluded that reservoirs with short water retention times and a relatively small flood area are not as subject to heavy sedimentation and particulate suspension (Brandimarte et al. 2008). Similar assertions were based on a nine-month monitoring scheme to quantify nutrient and sediment retention capacity of the Iron Gates I Reservoir (Teodoru & Wehli 2005).

The issue of an increased heightened rate of sedimentation and particulate suspension is not, however, a unique archaeological concern. Watershed management from the onset of a damming project is perhaps the most effective technique for minimizing damage to the archaeological site and surrounding environment. Of priority to watershed management engineers is the concern of storage loss (Teferu & Stroosnijder 2007; Terry 1995; Dixon, Talbot & Le Moigne 1989). Through a series of mathematical calculations (presented below), one deduces storage loss and precise rates of sedimentation (Graf 1983, 1984; Palmieri 2003). In the future, this information may extend resonance and meaning into the research based around the erosive effects of the reservoir on archaeological sites, either via further mathematic calculations or through the computational power of a geographic information system (GIS). It is with these ends in sight that future watershed management plans must include a set of archaeological considerations for individual reservoir projects.

If effectively implemented, watershed management can minimize sedimentation and extend a reservoir's useful physical life, through the control of road construction, mining, agriculture, and other land use in the upper catchment area. Protected areas are sometimes established in upper catchments to reduce

sediment flows into reservoirs, as with the Fortuna Dam in Panama and the proposed Rio Amoya (Colombia) and Nam Theun II (Laos) projects (Ledec & Quintera 2003). Aside from watershed management, other sediment management techniques for hydroelectric reservoirs may at times be physically and economically feasible; they include, among others, upstream check structures, protecting dam outlets, reservoir flushing, mechanical removal, and increasing the dam's height (Ledec & Quintera 2003; Graf 1988).

Stratification in a reservoir occurs when the lake's upper zone (epilimnion) divides thermally from the deeper zone (hypolimnion); the deeper zone becomes stagnant, lacking in dissolved oxygen (anaerobic) and rendering itself thereby unsuitable for most aquatic life (Ma, et al. 2008<sup>19</sup>). This has the potential to be both beneficial and detrimental in an archaeological sense: the anaerobic condition prevents most types of bacteria and variants of zoo- and phytoplankton from destroying wood and other organics potentially found in a site. However, without aquatic plant growth and a covering of sediment over the site, any change in water flow could cause severe damage to the waterlogged site- the movement of stones and small particles in the water erode, and that the site would not be well covered would expose it to redistribution on the reservoir floor in a similar manner to seabed floor redistribution (Muckelroy 1978). In the unchanged anaerobic state, as combined with cold water temperatures, good preservation of the site is extremely likely (US Army Corps of Engineers & Submerged Resources Unit 2007; Beutal 2006).

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<sup>19</sup> Ma, et al. 2008 also asserts that the "rapid estimate of stratification tendencies in a reservoir can be obtained with the Densimetric Froude Number (F). F can be calculated as:  $F = 320(L/D)(Q/V)$ , where L = length of the reservoir (metres), D = mean reservoir depth (metres) (for which dam height can be a proxy), Q = mean water inflow (cubic metres per second), and V = reservoir volume (cubic metres). If F is less than 1, some stratification is expected, the severity of which increases with a smaller F. When F is greater than 1, stratification is not likely."

The most predictive studies of sedimentation rates and degree of particulate suspension are in the form of laboratory experiments and pointed formulas.<sup>20</sup> As there are no formulas specifically used to determine sedimentation on archaeological sites, or to compute the erosive factors, equations taken from hydrology, engineering and calculus might be helpful in generating answers pre-inundation, though this remains untested. These formulas and principles include but are not limited to the hypotheses of the hydrodynamic model, including Reynolds stresses, fluid density, backwater curves, "Law of the Wall" and Chezy's formula (see Henderson 1971; Terela & Menendez 1994, 84).

Moving beyond the realm of riverine and reservoir specific sedimentation studies, is seabed wreck archaeology. In this area, wreck sites and site formation processes surrounding archaeological sites have been studied intensively (see Muckelroy 1978, Schiffer 1987; Caston 1979; Weier 1974; Ferrari & Adams 1990), and site equations developed for their predictive qualities. For instance, Ward et al (1998) propose that wreck disintegration ( $\delta D / \delta t$ ) may be plotted against the relative sedimentation rate ( $\delta S / \delta t$ ), which is a first order control on the forces of degradation (physical, chemical, and biological). These combinations of water-based deterioration with sedimentation gives rise to several scenarios: 1) rapid rates of burial and slow rates of deterioration, resulting in a well-preserved wreck in several metres of sediment; and 2) increased rates of erosion and deterioration (Skibo & Schiffer 1987: 91), resulting in very little preservation when in an exposed underwater position. Their model is independent of time or scale, and is thus applicable to the wreck as a whole or to individual components, and a wide range of

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<sup>20</sup> For further mathematical explanation and referral, please see Osgood, 1907 and Ryan, 2003. These two sources have been invaluable in the learning and deciphering of equations throughout this study.



timescales, making the model extremely useful in potential application to reservoir archaeology (Ward, Larcombe, and Veth 1999).

## 4.2 The Cost-Benefit Approach to Dams

Over the past twenty years, as the expansion of the heritage sector and the increased awareness of cultural resource management have reached present levels (NPS 2012), a certain skepticism and increased controversy surrounding dams has risen (Fahim 1981). Nigerian ecologist, Omo Fadaka, said dams are essential dreams that have failed Third World countries (1978), while well-known hydrologist, Samuel Kunkel, with the Food and Agriculture Organization stated in the *New York Times* that 40% of the dams in the world were useless. If dams have been the disappointment of dependent and hopeful populations of the developing world and even hydrologists –who know the field far better and with more objectivity than a population suffering from potential cognitive dissonance- why are they still built? Why are “superdams” and “megadams” on the rise? Most importantly, how is the construction of these dams justifiable, given the high rate of overall criticism and outrage when dam construction and archaeology combine?

Some facts are not up for dispute or criticism though: the population is increasing and the UN estimates the population will reach 10 billion people by the turn of the next century. People have a right to water, food and power. The majority of large dams are built for irrigation – and current estimates suggest 30 – 40% of irrigated land now relies on dams (Niasse and Wallace 2002). The majority of major dams are built for hydropower; dams generate nearly a fifth of the world’s electricity. There are over 800,000 dams globally, of which more than 40,000 are large dams,

and 300 are major dams (>150m tall, with a particularly large reservoir). So far, over 400,000km<sup>2</sup> of land has been flooded according to International Rivers (2007).

To reconcile socio-economic needs with posed threats and damages, impact assessments are carried out on dam projects, assessing feasibility, long-term stability of the dam and reservoir, probable energy and water outputs, variables in sedimentation, social impact, environmental impact and archaeological impact: the cost-benefit analysis. Cost-benefit analyses are not simple mathematical formulas with set computation guidelines, though, and the varying degrees of ‘benefit’ and ‘cost’ are flexible, subjective estimations (save more mathematical figures, such as monetary cost, water storage capability, and kilowatts of energy produced). As Fahim (1981: 4) asserts,

“No two dams are exactly alike; nor have they necessarily been built for the same reason... The conventional cost/benefit approach, which depends largely on physical and economic variable, is therefor insufficient to account adequately for the socioeconomic, political and psychological aspects of water resource development, which are very difficult to quantify. The impact of dams and concomitant water reservoirs on environment and people requires long-term monitoring; it is by no means a one-shot study or a single-person effort, nor is it within the conceptual framework of a specific discipline... a broader perspective and constructive communication among the involved researchers are basic to integrated and reliable findings.”

This cost-benefit assessment is applied to all dams, regardless of size, region or intended purpose. In forming an understanding of the cost-benefit process, one must first establish the guidelines applied to the undertaking of it as well as the motivation behind each dam. While each cost-benefit analysis contains slight

differences in terminology, the basic steps and considerations are synthesized as follows:

1. Define a referent group
2. Select a portfolio of alternative projects
3. Identify potential impacts of the project
4. Predict quantitative impacts over the life of the project
5. Monetize all impacts
6. Discount for time to find present values
7. Sum: Add up benefits and costs
8. Perform sensitivity analysis
9. Recommend the alternative with the largest net social welfare value.

(Chutubtim 2001)

The lingering affects of dams are potent and are neither considered fully in the cost-benefit analysis stage of planning nor during the practical construction phase. Instead, the impact assessments of dams are written years after the dam and associated projects are completed. Seemingly, only in hindsight can researchers then highlight the successes, failures and true cost-benefit of the dam. Monitoring, even from the early stages of planning and construction, does not guarantee that risks can be reduced to zero (Cornell and Tagaras 1986). Because the Aswan High Dam features prominently as one of the case studies in this thesis, the following points demonstrate the proposed ‘benefits’ and ‘costs’ of the project, as assessed by Fahim (1981), Shibl (1971), Hassan (2007) and UNESCO (1986):

The benefits accrued from the dam include:

- Conversion of basin irrigation into perennial irrigation with a total area of 983,000 feddans (1 feddan=1.038 acres).
- Increasing the area of arable land from 5.8 million feddans to 7.4 million feddans.
- Increasing the crop area from 3.8 million feddans in 1952 to about 14 million feddans in 1993 because 80% of the arable land is cultivated at the rate of two crops a year and the remaining 20% at three crops per year.
- Increased access to drinking water in villages all over Egypt.
- Improvement of river navigation throughout the year.
- The Aswan High Dam Lake (Lake Nasser) became a major source of fish, producing 40,000 tons per year.
- Electric power from the dam (10 billion kilowatts per year) - essential for the industrial development of Egypt.

Associated 'costs' included:

- No long-term monitoring
- Silt deprivation through the Nile delta and lower stretches of the Nile Valley
- Erosion of the Nile delta by the Mediterranean sea, as deposits of ground replenishing silts no longer accumulate
- Forced relocation to include thousands of Egyptians from Wadi Halfa through valley inhabitants in the hereto uncompensated Sudanese and government of Sudan
- No sustainability of capacity building. In addition to support for museums, support should have been given to the establishment of an up-to-date facility for training and education of Sudanese and Egyptian archaeologists, restorers,

historians, conservators, architects, managers, and ethnographers who could have carried on after the foreign missions have left. Sadly, both Egypt and the Sudan are badly in need of qualified staff, as sites deteriorate or vanish at great loss to humanity.

- No attention to the rescue of areas which have been threatened as a result of the construction of electric towers, roads, canals, new towns, land reclamation, and factories.
- No consideration for the effects of hydrographic changes, for example the annual pattern and height of the water table, on monuments all along the Nile Valley and in the Nile Delta.
- The rescue operations were undertaken at a great price for Egypt, since one of the conditions was that expeditions of member states were entitled to 50% of all finds for the museums of their respective countries.

Final commentary about the non-specific set of benefits and costs come from Wisely (1972: 29) who points out that “...detractors of this great project will do well to view it from the right end of their binoculars, in proper focus.” Later discussion of the controversies around dams will come back to this notion, keeping in mind that the viewer and the project changes.

### **4.3 Dam Controversies**

To help bring understanding to the controversies surrounding dams, one notes that regardless of the rationale behind dam building, certain key words and topics are highlighted again, and again. The author, attempting to illustrate in ‘real time’, the controversies surrounding dams and perceptions of them (compared to purely

academic writings), utilized a free online tool (<http://www.writewords.org.uk>). Through the use of the online tool, it is possible to capture the types of things people write about when they write about dams and hydropower, or dams and cultural heritage, and how they write about current issues surrounding these topics. The following graphs are provided to illustrate what people write about, and how these topics relate to the issue of controversy and perceived importance as part of the cost-benefit analysis of dams.

Each of the charts below only show words that appear 6 or more times in the headlines and summaries (i.e. the keywords and most important / most attention grabbing words) of news articles compiled on the How to Build a Dam and Save Cultural Heritage website dating between February 1, 2012 and May 28, 2012 (Stammitti, Cunliffe, & De Gruchy 2011).

Figure 5 shows the people associated with hydroelectric projects – they are discussed as the work of governments, rather than individuals. Figure 6 displays words of geographic scale that people use when writing about dams and hydropower or dams and cultural heritage. Similarly, further charts below display the frequency with which other themes of words appear in article headlines about dams and hydropower or dams and cultural heritage.

As displayed in figures 5-11, dams are perceived and promoted as national or global projects, dealing with need through power generation. The financial cost of dams is mentioned far more often than the controversy they create. The results of dams – electricity, hydropower and power – are mentioned more than any other word. These words occur more than 100 times, with energy occurring more than 150 times. This is not particularly surprising, but what is noteworthy is the words that are not as

popular. Energy is important, but it is not framed in terms of need, or a solution, or even in terms of the future, which it is supposedly to assist. Solution occurs just 6 times. Rivers and water occur more than one hundred times in the context of dams, but reservoirs (and therefore the impact of dams), do not. Irrigation, another oft-cited purpose of dams, occurs only 8 times, despite the vast amount of internet resources teaching children that it is one of their top three purposes. They are framed in terms of need, supplying renewable energy, but the costs are not discussed. Even the word ‘people’ – those whose needs the dams are presumably supplying – comes up less than 40 times. Perhaps they are not part of the equation. Certainly, their heritage is not -the least frequently used word categories are those to do with archaeology and cultural heritage (Figure 11). (‘Sites’ does not necessarily even refer to archaeological sites, but the site of the dam). That heritage and archaeology is so infrequently occurring flags up that this field is under-represented in all forms of digital (including scholarly) literature.

With the presented discrepancies between the intended purpose of dams and what their uses inevitably compromise, and how perceptions of dams have evolved, it is natural that controversy around dams would remain contemporaneous and derisive. The types of terms often found associated with dams and archaeology are pejorative at best, with most common references taking the form of loss-phrases, e.g. “wiping out heritage” (Aydinoglugil 2012), and the notion that sites will “vanish forever, like Bamyán” (Bukhari 2011). This attitude is not new. As early as 1898, Penfield (1989: 8) points out that engineers involved in the Aswan project asked, "What is a useless temple in comparison with a work involving the welfare of millions of human beings?" The archaeologists, accordingly responded with, "Are

sordid commercial motives to override everything artistic in the world? And is a priceless monument of antiquity to be lost to civilization that a few more fellaheen, already prosperous, may grow more cotton and sugar and grain?" (Penfield 1898: 9). Clearly, the conflicts have yet to be fully reconciled.

Fortunately, some attempts at reconciling the controversies surrounding big dams and their potentially unfulfilling roles<sup>21</sup> have been made from the heritage side of the dams dispute. Lenihan (1981) suggested an array of policy mechanisms aimed directly at the better protection and conservation of some types of archaeological sites in the USA. Brandt and Hassan (2006) presented a range of potential policies aimed at the holistic understanding of reservoirs on landscapes. The "How to Build a Dam and Save Cultural Heritage" initiative continues to advocate holistic and inclusive planning of big dams, towards the creation of a 'best practice guide' for the dams industry vis-à-vis the heritage sector. None of these attempts or best practices has proved themselves indisputable or terribly effective.

Controversies around dams are, unfortunately, as likely to continue for as long as dams are being built, and there are two actions that will minimize both the controversies and their effects: the holistic implementation and understanding of all of the research and planning that goes into dam engineering (heritage, socioeconomic benefits, environmental impact assessment, revenues and profits, long-term stability) and the policies affecting it. Secondly, as Fahim (1981: 40) points out, "It is more meaningful at the present time to direct attention toward the development of adequate policies to manage the project better and get the most out of it." So controversy must take a sideline to the observable effects from perfect hindsight, and

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<sup>21</sup> Heritage is damaged or loss, revenues are not as high as anticipated, flooding events are worse or more impactful than pre-assessments indicated, or there is a feeling amongst the populations that the dam has not caused a change in quality of life [style]



make strides to a better mid-term and futuristic management plan for all current dams and their concomitant water basins.

#### **4.4 Human Perspectives: Dams as Conflict**

Just as prominent monuments and structures of nationalism can play a role in identity creation and the hastening of availability of resources for the population, so, too, can they play a role in conflict; namely, conflict between local and displaced group, and the engineers and workers whose aim it is to relocate them. This is the human perspective. It exists outside the realm of government incomes and branded tourist sensationalism: it is how local populations feel, react and live alongside newly constructed large structures- both the dams and reservoirs. The anthropology of populations' relationship with dams, the groups' relocations (when applicable) and their feelings toward the entire development do not go unaddressed in this dissertation. After all, archaeological resources and community relationships with them are anthropological issues, and form the focal point for most heritage and cultural ownership debates.

Historical studies of the social impacts of dams date most notably to the early 1950's, with the [then] groundbreaking and long-term research by Thayer Scudder, who studied the impact of relocation on the Tongo People<sup>22</sup> (Scudder 1973). Scudder is not the only anthropologist to study such effects though; David Smock (1967) worked as a relocation manager in Nigeria and kept notes of the complicated relocation project. John Bennett (1976; 1996) placed the use of anthropological research in the field of water resource development through a historical perspective. More recently, Veronica Strang (1997; 2004) discussed attitudes of indigenous

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<sup>22</sup> In connection with the relocation related to the construction of the Kariba Dam.

Australian peoples about water and water control mechanisms, while Giesen et al. (2011) continue to study the holistic effects of water rights development on indigenous populations in Southwestern USA.

Dams represent a new way of life for those they affect and can often cause problems rather than solutions, if the transition lacks careful and proper planning.

Fahim (1990: 5) suggests that dams can "...sometimes initiate hostilities where they are intended to promote economic prosperity." This is a complicated and delicate set of circumstances. He suggests that when anthropologists and other social scientists (to include archaeologists and other heritage sector workers) research long and short-term effects of relocation or large dam building on local populations, they are subject to several pitfalls, the first of which inclusive of the fact that anthropological literature tends to look at technological change as harmful to the subject people. Anthropologists must realize that as the purposes of large-scale modifications are regional and national in scope, the dislocation of local lifestyles is, as Bernard and Peltó (1972) discuss, largely incidental to the 'greater good'. Confinement to just one local effect of the dam is a narrow approach to the study and the assessment of its implications. As Yannis Toussilis (2007) observes, the anthropologist often adopts the values of the population under study. Unfortunately, due to the large number of conflicting positions that confront the anthropologist in the field, an objective approach to the problems of the local people is sometimes lost or forgotten. The tendency to advocate the positions of the locals in a somewhat impractical and shortsighted way hinders progress and an understanding of the plans

of the ‘outsiders’ who often view circumstances very differently and in a largely national or international context.<sup>23</sup>

For true “success” and understanding, dam building must always remain a process, and this is important for the conceptualization of the human implications of dams. The scope of analysis must include four levels: local, regional, national and international. Additionally, in identifying and assessing the human implications in water development projects, we must be quite aware that there are always some implications that can neither be subjected to quantitative analysis nor be perceived in terms of figures and ratios, as possible in the standardized cost-benefit analyses. Yet they are extremely important and should not be overlooked or underestimated. At the fore of these discussions is the human perspective, and that aspect must always undergo consideration in both the long and short-term (Dissard 2011). Some of the consequences of dam construction are immediate, such as the necessity to displace communities affected by the new reservoir (or lake). Still others are long ranging and will affect people, their new environment, and their societal cultural permanently.

#### **4.5 Dam Construction and the Removal of Archaeology**

The dam is a symbol of discovery, preservation and destruction. When the socioeconomic and anthropologic aspects of the dam construction phase are set aside, we are left with contradiction on the part of the archaeologists involved in the salvage process. Shoup (2006: 245) notes that

“...the apparent contradiction between planned flooding and continuing tourism disappears if archaeological sites are

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<sup>23</sup> For key case studies involving this anthropological perspective, see Gonzales 1972; Gonzales 1976; Rocha, 2012; Iancu, 2011; and Strang, 2009.

thought of primarily as spectacular entertainment that can be moved without compromising their main purpose.”

Floodplains rich in archaeological resources reflect a stereotype as merely containers of artifacts, rather than what Shoup (2006: 240) calls “a context integral to determining their meaning”. Salvage excavation focuses on the recovery of pieces of archaeology, incapable or as-yet unwilling to preserve the political, economic, sacred or natural landscapes that are also important cultural identifiers. Salvage teams consist predominantly of foreign professionals<sup>24</sup>, although changes in the way excavations and survey takes place are slowly transitioning to incorporate local people who are trained and charged with real responsibilities (e.g. The excavations in Lesotho; see Arthur 2011; Arthur et al 2011), rather than the bucket-carrying tasks associated with colonial archaeology abroad. The motives that drive archaeologists are often very different to those of members of the public, making local specialization and training a priority. Foreign archaeologists who work on salvage projects are conflicted: while there is lamentation of the loss of sites, there was also hesitation in questioning the dam’s rationale (Shoup 2006) and generally lacked the mechanisms with which to view the regional archaeology holistically. Due to time and budgetary constraints in racing against rising waters, archaeologists still focus on saving artifacts.

One illustrative example of this is seen in the decade-old case at Zeugma, Turkey, where the Southeast Anatolia Project, “Güneydog u Anadolu Projesi” (GAP) press release was entitled “The Zeugma Mosaics will not be surrendered to the Euphrates” (Stubbs & Makas 2011), suggesting that the mosaics were the only things

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<sup>24</sup> THIS HAS PARTICULARLY BEEN THE CASE IN THE CASE STUDY DISCUSSED IN THIS DISSERTATION, IN EGYPT, AND ALSO PREDOMINANTLY THE CASE IN TURKEY AS WELL AS IN BRAZIL. THIS TREND IS CHANGING AND LOCAL POPULATIONS, NOW TRAINED AS ARCHAEOLOGISTS, ARE BECOMING MORE FULLY INVOLVED (ARTHUR 2011).

worth saving. Moreover, early work at Apamea found ‘nothing of archaeological value that could be moved’ (Shoup 2006: 11), leading again to the assumption that either archaeological resources are most valuable when they can be relocated (toward bringing in tourist revenues), or that they are inherently lost to mankind. Why should notions of archaeological value remain linked to the ambitions and intellectual curiosities of the present, rather than looking to link the past with the future? Since archaeology *can* act as a tool for linking past and present, and present with future, it can play a role in shaping the transition between the undeveloped past and the developed future.

If archaeological rescue projects continue to portray archaeological research as the excavation of foreign soils toward providing artifacts for display or for largely developed countries' information (Tilley 1989; Holtorf 2005: 28, Welsby and Davies 2001), archaeologists will continue to assert that the preservation of the specific character of individual places is “not as important as the continued ability of the public to participate in this spectacle whether through reading about research, viewing pictures of artifacts, or visiting sites and museums as tourists” (Shoup 2006: 248). This portrayal of archaeology has striking omissions. The anthropology and resource management aspect of archaeological responsibility is lost. Returning to the case of Zeuga, GAP mentioned only in passing the flooding event of Belkis village and displacement of its 6,000 inhabitants. Further, GAP asserted that it was “possible to identify... all remains existing within these boundaries [of the flooded area]. Consequently, all relevant information about the site has been collected” (GAP 2001: 9). This claim is also troubling in that less than 1% of the flooded area at Zeugma was excavated, and no full area surveys took place (Shoup 2006). This

demonstrates how, without an approach that is developed holistically and realistically, taking into account the option that long term monitoring or underwater excavation is an option, archaeologists are acting in the artefact and information retrieval roles of their funding bodies, and placing values and prioritization according to their own research needs. This agenda-based decision making is not limited to this case at Zeugma, but reflects the potential pitfalls of foreign institutional funding for rescue projects.

A close assessment of the effects of freshwater submergence on archaeological resources will help to clarify how the options of monitoring, and underwater fieldwork are realistic, affordable and enforceable through the right types of long-term policy.

## CHAPTER 5: THE EFFECTS OF FRESHWATER (RESERVOIR) SUBMERGENCE ON ARCHAEOLOGICAL MATERIALS

The effects of freshwater submergence on archaeological materials are well documented, as are the effects of rapid submergence and the periods during which materials dry (see Hamilton 1999; Singley 1988; Jewell 1961; Lenihan et al, 1981; Halsey & Lusardi 2008). The processes affecting archaeological materials in this freshwater context are similar to, but different from those processes active in the saltwater or marine environment. The evidence for some types of freshwater preservation and some types of freshwater destruction often associated with lakes, lochs, rivers and occasionally reservoirs, this chapter is primarily concerned with the freshwater environments in reservoirs and investigates why some locations in the freshwater water column<sup>25</sup> are more likely to preserve or damage archaeological features. The characteristics of the zones throughout the water column are described, along with a brief account of how freshwater more generally affects the quality and resilience of different types of archaeological materials to include worked stone, wood, sediments, brick, metals and natural components (e.g. bone, leather, antler, etc.) typically associated with archaeological features.

This chapter is both chronologically and spatially organized in its layout. It begins with the chronological and spatial effects a newly filling reservoir has on archaeological materials. It continues with a lateral expansion on the description of the zones in the water column, detailing how each zone affects archaeological

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<sup>25</sup> A water column is a conceptual column of water spanning the distance from the very top of the body of water, down to its floor. The water column is used to describe different zones in that body of water, with upper, middle and lower zones of water having different characteristics supportive of differing types of flora, fauna and hydrodynamic action.

materials in it, and which variables are the most relevant to the survival of that material. The individual types of archaeological materials are brought to center with discussion of freshwater effects on those specific types of materials. Finally, the long-term changes and effects are discussed, including factors such as chemistry of the reservoir, sedimentation, and the long-term mechanical processes that will continue to affect materials.

## **5.1 Limnology's relevance to inundated materials**

Freshwater and saltwater are different in their chemical makeup, and therefore differ sometimes dramatically in their preservative or damaging effects on archaeological materials. This section explains the chemical makeup of freshwater, and how that chemistry relates to material stability.

In terms of reactivity of artifacts and archaeological materials, the most important freshwater ions are chloride, sulfate and iron (Reid 1965). Chloride is present as sodium chloride (NaCl), derived largely from road salts and fertilizers (Kelly et al. 2008). It is not as prominent in freshwater as it is in saltwater, but it is significant enough to stimulate corrosion on copper and iron. Sulfate, usually present less than chloride, is another corrosive salt. Dissolved iron, even in small concentrations, results in staining of organic materials and porous artifacts like ceramics (Reid 1965). Iron may also precipitate in carbonate scales associated with hard water, and serves as a reducing agent for organic matter (Reid 1965). Freshwater minerals change locally depending on the geological formation of the drainage area (Meybeck et al 1996). One physical quality of water crucial to its reactivity with archaeological material is surface tension: while water has a strong



internal cohesion from covalent and hydrogen bonds, its upper surface is less tightly held (Singley 1988). This region of lower attraction causes water to be absorbed by a variety of factors. The surface tension of water will decrease in the presence of organic materials and lower temperatures; it will increase in the presence of inorganic salts and higher temperatures (ibid).

One meter of freshwater absorbs approximately 90% of the sun's radiation, so that with each increased depth there is little light and heat in a reservoir's lower waters (Singley 1988; Lenihan et al 1981). Dissolved solids and suspended organic matter also reduce light transmission. Without light, there can be no photosynthesis and little support of plant life. In turn, as oxygen is lowered, biological degradation by microorganisms in the sediment will be affected (Singley 1988). These factors have a direct effect on the state of archaeological preservation, with environments sustaining low light and anaerobic conditions being favoured for greater likelihoods of preservation (Singley 1988).

## 5.2 Reservoir Fill Period

Reservoirs, as man-made lakes, and natural lakes differ from each other, and the phase of initial filling of the reservoir defines most of the effects that take place (on submerged materials) thereafter (O'Halloran and Spenneman 2002a). The filling phase and human-usage of the reservoir/man-made lake also redefines how the body of water will behave. Essentially, unlike the archaeological materials in lakes, lochs, rivers and estuaries, materials found in reservoirs undergo a period of more dramatic change. If materials are lost in the long-standing bodies of water, the material sinks below the surface of the water, reaching its resting place (taking into account some

inevitable redistribution) and subsequent equilibrium in sediment at the bottom of that body of water (Lenihan et al, 1981). pH changes take effect, and other forces will begin to act upon that material based on its unique composition. Preservation may or may not follow (Pearson 1987). With forces of erosion, sedimentation and alteration of chemistry at work, smaller dams are less likely to have harsher effects. Bhutani et al. (1975: 43) comments that, "any dam will have some effect... but larger dams with higher capacity, longer-retention reservoirs are more likely to produce chemical and biological effects." While the long-term effects of sediment burial are the same in lochs, lakes and reservoirs, it is the dynamic period of submergence (and water level change) pressed upon archaeological materials in reservoirs that creates a more vulnerable heritage environment in which enduring changes are likely to occur, compared to the effect on those objects dropped or collapsed in stiller waters (Pearson 1987).

The initial impacts on submerged resources are those caused by the filling of the reservoir. Initial impacts involve the superimposing of a riverine (lotic) ecosystem on a terrestrial one, thus creating a still (lentic) ecosystem (Bennet and Chorley 1978). This results in the mortality of lentic benthos, the migration of terrestrial organisms, and the development of photoautotrophic plankton populations (ibid). It is during this dynamic phase that submerged resources are most vulnerable. The filling period is characterised by a burgeoning of heterotrophic activity, sustained by the nutrient release from newly submerged soils, plants, and animal remains, resulting in the rapid change in general and localized water chemistry (Ackerman et al 1973). The changes in water chemistry then affect the chemical composition and potential biological activity acting upon archaeological resources,

altering their original chemical makeup and introducing new and potentially biological activity favouring conditions to the features or materials. As the reservoir fills, not only are chemical and biological changes taking place, but the actual filling process causes wave action and new density currents that carry silt in suspension. Turbid conditions follow (Holling 1973). The movement of wave action, and fill rate make submerged resources in the deepest area of the reservoir most susceptible to erosion, abrasion and chemical alteration during this filling phase. Since these resources in the deepest areas (i.e. usually those areas nearest the original stream or river), they will undergo the longest term chemical alterations, though will remain generally less affected by future instances of erosion and abrasion (Lenihan et al 1981). The study of annual changes in water depth on these deepest of features has not been studied.

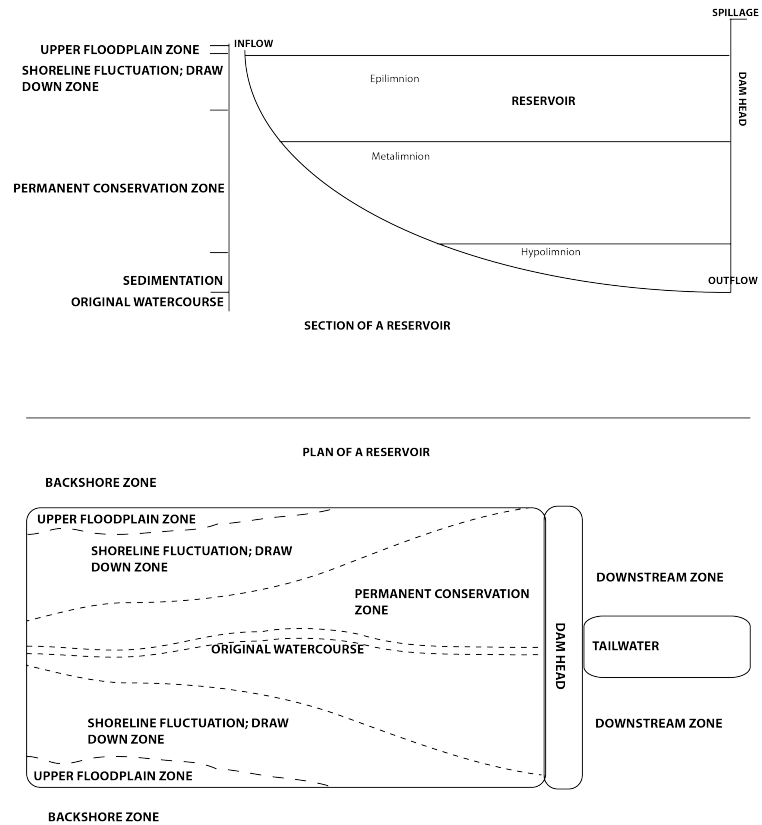
This raises the question of the actual difference between man-made lakes (reservoirs) and naturally occurring lakes, and how the two different settings lead to different effects on submerged resources. The physical limnology is different in both: circulation in reservoirs is based on inflow and outflow, rather than thermal circulation, which forms gentler currents. Sedimentation rates and variations are greater in reservoirs than in naturally occurring lakes and chemical compositions fluctuate, based not only on the chemistry of inflows and precipitation (in natural lakes), but also from the leaching of soluble materials from newly flooded soils (Cole 1975).

### **5.3 Water columns in reservoirs**

**Table 2 Reservoir layout, Stammitti 2015**

After the initial filling phase of a reservoir, the impacts and processes affecting submerged resources differ on the basis of in which zone within that reservoir's water column lays. A reservoir consists of five zones unique to reservoirs (vs. naturally occurring lakes): four within the reservoir and one external to it. These zones are different from the zones within any body of freshwater, i.e. those which are defined by the thermoclines in bodies of freshwater<sup>26</sup>. However, the zones in reservoirs that are more relevant to the preservation or deterioration of submerged resources are those that are unique to the reservoir (see Table 2). The four zones within the reservoir are as follows:

- Permanent conservation pool
- Shoreline fluctuation zone (draw-down zone)
- Upper floodplain zone
- Backshore zone (O'Halloran and Spenneman 2002a)



<sup>26</sup> All bodies of water have zones determined by thermocline and vertical location. In limnological terms, those zones include: the epilimnion (surface water), metalimnion (transition zone of large temperature change), and hypolimnion (deepest and cold, unmixed water) (Lenihan et al, 1981).

The zone lying external (downriver of the dam) to the reservoir is the "downstream zone".

The permanent conservation pool exists within the deepest part of the reservoir. This area of the reservoir is rarely exposed to the atmosphere, and archaeological material in this zone is generally only subject to the most damaging effects of inundation during the reservoir's initial fill (Lenihan et al. 1981), and this is due to wave action (O'Halloran and Spenneman, 2002a).

The shoreline fluctuation zone, or 'draw-down zone', is that zone where the average water level throughout the year is in constant fluctuation, in accordance with rainfall and water usage (O'Halloran and Spenneman 2002a). It is subjected to frequent fluctuation water levels, periods of wave action in near-shore areas and wave-induced currents (O'Halloran and Spenneman 2002a). This zone is the most likely area for shoreline erosion, sediment removal and artifact exposure and redepositing (Lenihan et al 1981). The consistent action of waves and poor post-flooding re-vegetation amplifies the erosive power of the water.

A reservoir's maximum holding area is known as the upper flood plain zone. This zone is only used or affected when a reservoir is filled to its maximum capacity. Due to the low impact from waves, the vegetation in the area has a good opportunity to establish normal density, giving good ground cover, minimizing the impact of flooding on cultural sites (O'Halloran and Spenneman 2002a).

The backshore zone suffers no impact of water motion from the reservoir as it is above the height of the dam. This zone is used for a variety of purposes: agricultural, woodland, or real estate development. However, as far as concerning the reservoir, archaeological resources are only affected by the potential water

motion from heavy rainfall or stream flow, from sources of water higher than the dam (ibid).

Situated externally to the reservoir and abutting the dam, the downstream zone is the only zone external to the reservoir. This area is subject to intense wave action caused by the water release through the spill gates of the dam wall (Lenihan et al 1981). It can show evidence of rolling stones and sand abrasion, and any archaeological sites in this area that were not destroyed during the construction of the dam are likely to have been redeposited downstream due to the fast currents, increased wave action and frequent flooding (O'Halloran and Spenneman, 2002a).

According to Kelley et al. 2013, the two most important controls on the preservation of sites are the rates of water-level rise and degree of shelter from waves. Therefore, features lying deep within the reservoir's water column in the permanent conservation zone are most protected from the effects of wave action. Since that zone only rarely becomes exposed to the atmosphere, preservation of most types of archaeological materials here is the best, as the materials also have time to become buried in sediments that protect those sites even further in the event of short-term atmospheric exposure (Lenihan et al 1981). In the permanent conservation zone, archaeological materials have time to reach an equilibrium with their surrounding environ, and preservation and durability can be measured in terms of centuries or more, rather than in the years or decades associated with higher water column situation (ibid).

The sedimentation associated with archaeological materials in the permanent conservation zone has a dual effect: at once preserving some types of materials and aiding in the breakdown of others (Blair 1992). Pearson (1987: 5) comments that

this layering up of sediment over archaeological materials may, in the long-term, have a corrosive effect on some materials, but that sedimentary coverage prevents ready access, which at times is a positive step toward protecting cultural resources from damage.

Silt compilation can act as a defense mechanism against biochemical forces as well as physical forces. If wave action removes this protection, the artifacts that have become accustomed to that protective layer will sustain more physical damage than artifacts that have been constantly exposed (Blair 1992). Buried terrestrial mineral soils, some of which contain the remains of smaller archaeological materials (e.g. charcoal, middens) have sharp boundaries with overlying peats and peaty deposits. These soils are likely to have lost some structure due to initial wave action upon event of the initial reservoir fill, but equilibrium is likely to occur in the long-term conservation pool (Balaam et al. 1987). A physical lack of charcoal can occur because charcoal becomes liberated from the slaked soil and floats away (Macphall 1994; Macphall and Cruise 2000). Heavy stone artifacts are unaffected (Grøn and Kuznetsov 2004).

Chemical changes can also occur where sedimentation occurs. Crowther (2000 and 2003) suggests on the basis of chemical changes, that the magnetic susceptibility signal of burned material is lost at such sites because of gleying<sup>27</sup> effecting the buried soil, resulting in the loss of magnetometer use in assessing site conditions. Gleying is a condition resulting from a prolonged anoxic state, usually in combination with a reduction in ferrimagnetic iron minerals (Crowther 2000). When the resultant ferric iron oxides chemically transform into their ferrous forms, due to

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<sup>27</sup> Gleying normally leads to a loss of any magnetic susceptibility enhancement signal that could relate to a hearth or other burning event (Crowther, 2000).

the long-standing anoxic condition, a resultant decrease in magnetic susceptibility follows, making magnetometer use in assessing site conditions, or locating sites, nearly impossible (Harris 2011: 140).

#### **5.4 Draw-down zone (Shoreline fluctuation zone) Effects**

The zone in which the most destructive physical actions take place is in the reservoir's draw-down, or shoreline fluctuation, zone (Lenihan et al. 1981). For archaeological materials situated in the draw-down zone, any preservative effects provided by full submergence is exchanged for rate of destruction. Materials located in this region of the water column endure the full effects of the environment in the form of:

- Wave action
- Water level fluctuation
- (Re) fill rate of the dam
- Angle of the basin slope
- Stability according to the presence of vegetation
- Impact of human visitation and trampling by grazing livestock (Singely, 1988).

##### **Wave Action**

Damage to archaeological materials in underwater archaeological settings occurs predominantly on marine shores, as noted by Bird (1992) and Spenneman (1987; 1992). In the inland underwater setting, inland wave action is just as problematic (Lenihan et al. 1981; Blair, 1992; Martin et al. 1994; Hudson and Bowler, 1997; Hope, 1998). O'Halloran and Spenneman (2002) further identified and studied the types of wave action most likely to produce instabilities in



archaeological sites in reservoirs, and concluded that most damage occurs to unconsolidated banks and shorelines: the draw-down zone. It is in this zone that wave action is most damaging, water level fluctuations occur most, vegetation loses its root holds, and impact on archaeological materials may be worsened by trampling from livestock and human passage (when water levels allow) (Lenihan et al. 1981). Wave action, considered on the basis of its own characteristic affects, is the most damaging force acting upon archaeological materials.

The height and velocity of waves are predictable in reservoir settings because the size, fill capacity and surface area of the reservoir are known aspects of the data. Height and velocity of waves relate most directly to the 'fetch' of the reservoir (surface-water area), where a larger fetch results in larger waves in a mathematically predictable way (O'Halloran and Spenneman, 2002a). There are several types of waves, and each type of wave produces a different effect on the draw-down zone. Types of waves present in reservoirs include: shoaling, spilling, plunging and surging (ibid). Of these, plunging and surging are the most destructive; the other two affect the movement and depositing of only light artifacts.

Plunging waves contain a motion that curls over the crest of the wave, causing the wave to plunge forward with high velocity (Murphy, 1990). In doing so, this type of wave results in the severe erosion of the reservoir shoreline and sand abrasion to artifacts moved about in this area. Waves are strong enough to move artifacts of medium weight, such as stones, small boulders (over time) and large timbers.

Surging waves do not have a breaking crest. Instead, the base of the wave collapses from under the crest, creating a strong current running quickly to the

shoreline (Lenihan et al. 1981). This type of wave is the most destructive. It is powerful enough to lift artifacts and sediments from lower in the water column and relocate them to the shoreline (ibid). Movement from one location to another causes added sand abrasion and rolling effect on the archaeological material (ibid). The redepositing of material higher than the usual shoreline also exposes materials to new environmental factors, weakening their physical and chemical resistance to degradation (Singley 1988). Surging waves also affect a sorting of gravel, stones and archaeological material into weight classes at intervals along the draw-down zone shorelines (O'Halloran and Spenneman 2002a).

Shoaling waves vary in height and velocity. In shallow water, they exhibit a breaking crest that abrades and redeposits materials that are close to the shoreline. In deeper water, breaking crest and forward wave-body movement redeposits light materials further up the shoreline (O'Halloran and Spenneman 2002a), leading to a severe loss of the archaeological record and loss of archaeological materials.

Spilling waves break gradually and form on near-horizontal (gradual) shorelines. They cause little or no deposition of archaeological materials (O'Halloran and Spenneman 2002a). Spilling waves are the "ideal" type of wave for archaeological and environmental conservation.

#### Water Level Fluctuation

The yearly fluctuation in water levels has a regular, destabilizing effect on archaeological materials in the draw-down zone. Chemical changes occur regularly as organic and soluble materials are leached from the soils as they undergo periods of submergence and subsequent drying out (Singley 1988). The physical action of the fluctuation is also problematic. The receding water removes trace elements and sediments, pulling them back from the shoreline into deeper water, an action that can

displace both supportive vegetation and redistribute smaller archaeological artifacts (Padgett 1977). If the water refills quickly, the action mimics surging wave action, displacing artifacts and sediments, and creating abrasive and eroding conditions (O'Halloran and Spenneman 2002a).

#### Angle of the Basin Slope

Lenihan et al (1981: 45) assert that “the saturation of reservoir slopes during initial submergence often results in dramatic alterations of slope geometry” and that it is this alteration that may result in full “slope failure”. Slope failure occurs when angle of the slope changes significantly enough that remaining sediment stability is compromised, making shifts and further instability inevitable (Castro 1969). The overall slope of the reservoir basin upon initial filling has a direct impact on long term stability of the slope and sites in the lifespan of the reservoir. Slope steepness influences the fill rate and water fluctuation rate (Rayl et al. 1978). The steeper the slope, the slower the fill and greater the impact; the more gradual the slope, the faster the fill and lower the impact (ibid). Wave energy is greater on steep slopes than it is on gradual ones, where shoaling waves dissipate much of the force of the breaking wave (Lenihan et al. 1981). Steeper slopes are also unstable, lending themselves to the full extent of current erosion, and eventual slope failure (Castro 1969).

#### Stability associated with Vegetation

Vegetation on the slopes of reservoirs quickly lose their hold in their rooting soils when water levels rise and erosion from wave and fill action take place (Lenihan et al. 1981). Pre-existing species of flora may have disturbed archaeological layers in the soils, known as bioturbation, (Rolfesen 1980), but will also have worked to hold sediments in place. The loss of vegetation not only signals the imminent threat of further soil erosion and the washing away of archaeologically

relevant contexts and materials, but also heralds the arrival of aquatic species. Aquatic variations of vegetation are not inherently damaging to archaeological materials; they may offer temporary erosion protection, though their defenses are limited in the draw-down zone where periods of drying out may cause their eradication (Lenihan et al. 1981). In this sequence of vegetation loss, replacement and loss, archaeological materials are further displaced and erosion continues.

#### Impact from Visitation and Trampling

Impacts from human visitation and trampling are the result of a change in usage patterns when the ecosystem changes from riverine to reservoir. The trampling that may have earlier occurred in an agricultural setting is amplified due to the loss of vegetation and topsoil (O'Halloran and Spenneman, 2002a). Animal trampling occurs due to the change in water levels<sup>28</sup>, and includes areas where archaeological materials were previously covered by sediments. This was observed in a follow up inspection of the Fruid Reservoir in the late spring of 2013, when water levels were low enough to allow terrestrial inspection of a previously submerged workshop (see Chapter 5.4.2). Observations made by the author included the habitation of a collapsed workshop (see FR03, Chapter 5.3c) by small flocks of sheep, with waste evidence from the animals scattered across the workshop and areas surrounding it. The animals, it seemed, took shelter from windy conditions by nestling beside sections of standing wall and debris. The long-term effects of animal habitation or trampling (possible with archaeological materials of a lighter nature, i.e. soil layers, smaller artefacts) has not yet been documented. However, in the case of

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<sup>28</sup> In agricultural settings in Britain, the USA and Egypt, animals can freely roam onto lower, wetter ground when reservoir water levels dip. Herds of sheep, cattle and other livestock feed on fresh grasses when they emerge, wander about, and drink from the reservoir.

agricultural settings, the structures seem more vulnerable in the periods when they are emerged from the reservoir, than when submerged.

The various types of human visitation to sites, which include pedestrian recreational visits, boating/fishing, and vandalism, pose a more dramatic and varied threat to archaeological materials (Nutley 2007; O'Halloran and Spenneman 2002a; O'Halloran and Spenneman 2002b; Lenihan et al. 1981). The interpretation of sites comes under threat when modern refuse litters sites that have been removed of topsoil, and where artefacts from earlier periods are already strewn, thereby confusing any remaining archaeological record and context. A study of reservoirs conducted in 1999 and 2000 by O'Halloran and Spenneman (2002b) provided evidence for up to 10% of artefacts collected as being of modern origin, and included modern glass, tins, disused fishing equipment and food packaging. Further, the clean up work associated with litter-prone reservoir banks may prove more damaging than useful in that volunteers to cleanup work may mistakenly remove or displace older artefacts, making future site interpretation even more difficult. In addition to the more obvious problem of litter, there remains the potential effect of boat-generated wave action, and the possibility of soil-churning where boat engines drag and kick up the sediments of shallow bottoms (O'Halloran and Spenneman 2002b; Lenihan et al. 1981).

A less documented but equally important factor to consider is the potential for vandalism to sites when they are above the water level. Vandalism seems to have been less a problem in areas surrounding reservoirs due to their previously isolated locations in a naturally forested or fielded stretch of land. Reservoirs, however, attract people for fishing and other recreational uses, and the land clearing associated

with reservoir preparation works makes archaeological features more visible, especially in the event that the reservoir has eroded the surrounding sediments away. Nickens (1991: 6) considers, "The worst of these actions, those related to vandalism, are particularly damaging since they lead to destruction without any return of scientific information." Divided into categories of institutionalized destruction, predatory vandalism, and malicious vandalism, all forms of human intrusion have a far more devastating and faster-acting effect on archaeological materials than environmental processes alone (Nickens 1991; Lipe 1994; Williams 1978; Wood & Johnson 1978). Dunn (1996) focused solely on impacts to cultural resources in reservoir draw-down zones due to vandalism, and further addresses the means of mitigating the number of vandal-related incidents.

## 5.5 Other Water Column Effects

The other zone within the reservoir that creates the greatest effect on submerged resources is the permanent conservation pool. Effects in this zone are limited to the erosion and abrasion acted upon submerged resources when the reservoir was in its initial filling phase, and the chemical changes those resources underwent through the period of filling, settling and the leaching out of soluble materials from the soil. The chemical changes and effects in this zone occur long after soluble materials leach out and enact change upon the archaeological resources. These heightened levels of chemical alteration can occur in the deeper pockets of the reservoir (Sylvester and Seabloom 1964). Chemical effects are based on threefold influences: water evaporation, soil leaching, and length of inundation period (ibid).

The organic content of the soil, stage of decay of organic matter, relative areas of mineral and organic soils, amount and type of stumps, logs, grasses and brush, as well as circulation and rate of water exchange all have direct effects on localised chemistry.

The chemical impacts on submerged resources are greatest where chemicals are concentrated (any of the above, e.g. organic matter, minerals, etc.), and this tends to coincide with the areas of greater depth and furthest downstream from inlet locations (Lenihan et al 1981). Deep waters by the dam have the greatest concentrations due to the fact that evaporation of that column of water has taken place there the longest, the bottom soils and strata will be the last to be sealed off by silt, and the deeper water below thermoclines favour the concentration of most dissolved solids (Sylvester and Seabloom 1964). Higgins and Fruh (1968) note that alkalinity, water hardness and conductivity increase with depth, and are directly related to bacterial activity in the reservoir. They further concluded that in the deepest waters, bacterial activity slows down.

There are means of understanding chemical effects before they happen, though most patterning of chemistry in reservoirs is aimed at limnologists and not archaeologists (Lenihan et al. 1981; see Cleemput et al. 1975, Golterman 1967, Cooper et al. 1971). The true chemical environment of an underwater site will be that of a saturated soil matrix, calculable through factors such as: the annual evaporation excess or deficit, understanding the water chemistry of a river to be impounded, and considering the soil matrix surrounding specific known sites of archaeological heritage (Lenihan et al. 1981).

The actual effect of different water chemistries is discussed to a limited extent in the section below, which focuses on limnological effects on different types of archaeological materials.

## **5.6 Potential long-term effects of inundation on assorted archaeological materials**

This section is dedicated to discussing the many different types of effects that archaeological materials undergo on the basis of that material's location relative to the reservoir water column. Generally, all materials are most greatly affected when they are located in shallow reservoir waters, most specifically in the draw-down or water level fluctuation zone.

### **Ceramics**

Ceramics of all classes are composed of raw or refined clay that is shaped and fired. In general, ceramics fired at lower temperatures will be more porous and friable. The most common problem associated with submerged ceramics is that of soluble salts when submerged in salt water. Upon drying, these salts migrate to the surface and crystallize, exerting enough pressure to disrupt surface stability and any glazes that may be present (Singley 1988). Ceramics in freshwater are less likely to be as affected, but must nevertheless be dried out slowly to check for the presence of residual crystals. Long term exposure to water may cause softening of the fabric of low-fired earthenwares (Singley 1988). Hand-painted surfaces may lift from porcelain surfaces, and surfaces may be subject to further disruption through the abrasion of shifting sands (ibid). In anaerobic conditions, sulfate-reducing bacteria can cause discolouration of glazes (ibid).

### **Glass**



Although glass has a long life in low abrasion conditions, it can be subject to hydroelectric attack and the leaching of alkalis (especially potash and soda,), even in fresh water. Ion exchange, in which a hydrogen ion trades places with a similarly charged  $\text{Na}^+$  or  $\text{K}^+$ , causes a weakened and hydrated silica network (Singley 1988). In this event, the thickness of the glass decreases and the glass turns into thin sheets. Cold waters reduce the reaction rate (Singley 1988). Glass buried in sediment may respond to a different microclimate, in which reaction rates slow. Glass subjected to the movement of sediment undergoes reaction changes faster (ibid). Water may then cause glazing, painting or sandwiching<sup>29</sup> to separate.

#### Corrosion process of metals

When a metal artifact corrodes, the corrosion product is a mineralization (e.g. an oxide or carbonate). The artifact is, in a sense, returning to a state of lower energy, to the ore from which it was made (Butler and Ison 1978). Electrochemical, or galvanic, corrosion occurs where a metal or phase having the lower electrode potential serves as the anode and readily loses electrons (ibid). The more noble metal or phase, the more it is protected as the cathode. In freshwater, the likelihood of corrosion on a microscopic and macroscopic scale is enhanced by the presences of salts like sodium chloride and calcium carbonate (Butler and Ison 1978).

Further problems can arise from bacterial corrosion. Very common in freshwater are sulfate-reducing bacteria (*disulphovibrio disulphuricans*), which use hydrogen metabolically (instead of oxygen), reducing available sulfate to sulfide (Butler and Ison 1978). By stripping away the hydrogen evolved at the cathode, the bacteria depolarize the electrode and encourage more corrosion as compensation. The black sulfide corrosion caused by sulfate-reducing bacteria is noticeable on

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<sup>29</sup> The pressing together of layers of glass

silver, lead and copper (ibid). Biofilm, or slime, forms on iron, which shields the surface from oxygen (Costerton 1976). However, the bacterial film that attaches to iron does so using a polysaccharide adhesive that can bind with the available metal ions so a slightly alkaline pH is produced (ibid). As the film of bacteria exhausts the available oxygen, sulfate-reducers move in, and pits are produced at the anodes. This results in a gelatinous mass of hydrated ferric oxide, or "red water" (Singley 1988).

#### Wood (timbers, fencing, food vessels, other human-made uses)

Wood in freshwater is not affected by the marine borers that cause the devastation of many wooden materials found in saltwater. However, the degradation of wood is both chemical and biological (Grattan and McCawley 1982). With immersion, water will penetrate the wood structure, swelling the fibers and bulking out the structure (ibid). The proportion of water in waterlogged wood may be more than 200%, and in some cases, more than 400% water (Muhlethaler 1973). Biological agents move longitudinally through the cellular network. Eventually, water solubilizes cellulose and hemicellulose, breaking down the network by acid hydrolysis into its component polysaccharides, and finally into glucose (Muhlethaler 1973). The lignin framework of the wood is left behind, but the bulk of the cell wall, especially the S2<sup>30</sup>, may be removed. The weakened wall may delaminate (Singley 1988). Water carries bacteria and fungi, and they can attack selectively (Grattan and McCawley 1982). Some bacteria attack cell walls, while some fungi go up through the wood's natural crevices to penetrate cell walls, emitting enzymes that attack the cellulose (Stamm 1971). Hardwoods are more resistant because of their tighter pore structure. Heartwood is more resistant than sapwood (Oddy 1975).

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<sup>30</sup> The secondary and most protective wall layer

### Textiles

The fibers of cellulose, keratin and fibroin absorb water readily. Cotton absorbs about 25% of its weight in water, wool (33%) and silk (35%) (Singely, 1988). The water forces apart the fibers and smaller fibers, and is held there by surface tension and hydrogen bonds. The swollen fibers may strengthen with the new hydrogen bond supplied by the water (Singely, 1988). Over time, the fibers are subjected to hydrolysis. Silk and wool are broken down into their component amino acids, and cellulose into its complex and simple sugars (ibid). Soluble material is leached out. Water also introduces bacteria and fungi. Attack by microorganisms is enzymatic as well as acidic, severing the sulfur covalent bonds (Singely, 1988). Textiles are best preserved in sediment, provided activity by microorganisms is limited (Singely, 1988). As such, textiles are most likely found in deeper zones in reservoirs.

### Leather

Delamination is likely to occur to leather in freshwater. Tannins, colourants and fatty or oily dressings may be weakly bonded, and long-term exposure to water leaches out the additives, making the leather more soluble by opening up the helices themselves to hydrolysis (Reed, 1966). During immersion, the polarity of water will satisfy the charged areas of the collagen helices<sup>31</sup>, resulting in the possibility of physical swelling and bulking (van Dienst, 1985). If the water is removed, the fibers in the leather network will collapse. The helices will rearrange themselves and irreversibly cross-link, resulting in a hardened leather (van Dienst, 1985).

### Bone, Ivory and Antler

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<sup>31</sup> A collagen helix is a structure of primary importance in the tensile strength and durability of all animal skins. The collagen helices are responsible for holding layers of skin, or in this case leather, together.

The porosity of bone, ivory and antler permits the ready introduction and absorption of water-soluble humates and metallic salts. Mineral and organic phases of bone may be attacked during submersion (Brothwell, 1972). Under acidic conditions, the mineral component will be leached away (O'Connor, 1987). Strongly alkaline conditions attack the collagen network itself (ibid). It may be preserved in sediment that is sealed or rich in phosphate. The dissolution of the hydroxyapatite is slowed as micro-equilibrium is established around the material. Absorbed metallic salts inhibit bacterial attack (Brothwell, 1972). Keratinous materials are often poorly preserved largely because of their thinness (Singley, 1988). Disulfide linkages may be severed in reducing conditions or by sulfate-reducing bacteria (Singley, 1988).

## 5.7 Long-term prospects

The effects of reservoir inundation on full structures has not been discovered through any relevant literature reviews. A few literary sources of the post-emergence effect on structures exist (see Wyskup 2006; Lyons 1908)<sup>32</sup>. Structures still in a state of submergence and draw-down zone fluctuation are unstudied, and so little can be discussed about their long-term prospects. However, for the materials that have been studied, long-term prospects are generally good. Features in the water level fluctuation zone will be repeatedly subjected to erosion, abrasion and contextual redistribution, in addition to the terrestrial threats of trampling, wave action, and human visitation. These features are the most vulnerable in reservoirs, and action should be taken to mitigate destructive effects as quickly as possible. Those features situated in deeper waters are in a better position for longer-term conservation, since chemical changes act over a longer period of time.

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<sup>32</sup> these are utilized in the case studies presented in Chapters 5.3a and 5.3b

Inevitably, however, submerged resources will undergo some type change, whether those are chemical, physical, redistributive or biological. Those changes are not entirely unlike the changes that materials submerged in lakes, rivers or even saltwater undergo; they are processes that are generally understood and which good conservation measures and careful handling can slow or stop. Most of the changes materials will face in reservoirs will have destructive effects in the periods spanning hundreds of years (deeply situated features), while others will enact destructive change within a few years (draw-down zone features and materials). There is no one, long-term answer or prospect when speaking broadly about archaeological resources in reservoirs. The disparity between timescales of detrimental change to individual features and foreseeable lifespan of the reservoir are too great to formulate one long-term prospect that holds true for every type of submerged material in every type of reservoir.

For features that were surveyed pre-inundation, prospects seem better than for those that were not since with survey comes the potential for mitigation measures when those measures will offer the greatest protection. With archaeological survey plans, new teams can assemble and determine (whether through diving, geophysical reconnaissance or terrestrial archaeology) the best means of mitigating further effects of the reservoir. In certain circumstances, it is likely that no mitigation means will be necessary until the reservoir is at the end of its lifespan and the waters need drained. In other circumstances, fast action may be required to record or excavate features (sometimes undetected pre-inundation) within drawdown zones. Features and materials that were not surveyed before inundation require more thoughtful consideration. The locating of archaeological materials at the bottom of reservoirs

may prove a trying task, particularly in turbid, deep waters. Contrarily, diving techniques, equipment and archaeological divers, paired with surface-operated geophysical instruments, continue to improve in their effectiveness and cost-efficiency (Pearson 1987: 14; Van Rein et al 2012; ADA, 2010).

Regardless of whether submerged resources were surveyed or not prior to inundation, the simple fact remains that so long as dams are constructed, some type of cultural heritage (whether of our current past or a future past) will be submerged for some period of time. However, for most materials and features outside of the draw-down zone, context is not likely to be significantly lost in the short- to mid-term generations of underwater and terrestrial archaeologists.

*"If, as a citizen, I go to pick out one small stone from the archaeological site, I go to prison for three years under the law . But to destroy the whole thing is not a crime, apparently."*

-Mayor of Hasenkeyf, 1998

## **CHAPTER 6: LAW, POLICY AND PRACTICE: ARCHAEOLOGICAL RESOURCES IN RESERVOIRS**

There is currently a problem with the way in which archaeological and cultural resources are managed and in which legislation is formed in the United States, the United Kingdom, and Egypt: the case studies that comprise the backbone of this dissertation. There is little consistent management and as Pearce suggests, the current legislative measures “lack a strong disciplined presence and correspondingly an agreed framework of reference and research” in matters archaeological, which can be considered a problem of critical importance in the field (1998: 2). Different countries' legislations are complex, at times controversial, and based on that nation-state's unique culture and history and stem from its own traditional approaches to the larger issues of environmental resource and land management. Therefore, this chapter addresses the policies applicable to submerged archaeological resources in the United Kingdom, the United States and Egypt, to what extent policies exist at the international level, and the relationship between domestic and international policy. In keeping each country's set of policies and unique political systems clear, the chapter is divided into many subsections, each focusing on one country or international organization. Because the process of shaping national policies is paramount to the broader discussion of cultural resource management, the obstacles and opportunities within each legislative system also undergo discussion, in similar point-by-point formats.

These discussions involve the analysis of relevant British, American and Egyptian national policies, providing the reader with an understanding of how current heritage-based laws interact with each other and how the gaps in current

legislation are nevertheless ripe for growing inclusions for submerged and potentially submerged sites within legal jurisdictions. International laws and policies, relevant to archaeological materials in reservoirs, are discussed separately to give the reader a broader understanding of the mechanisms as far as they are applicable. A brief description of some of the setbacks faced by each country and whether religious, economic, or developmental problems or processes add significance to the understanding of the national agendas analyzed here and to the case studies later discussed in Chapter 5 are assessed. Finally, the differences between approaches to archaeological resource management and management policy, as applied to submerged archaeological remains is then briefly discussed in a cross-cultural analysis that includes brief comparisons with Turkey, China, Portugal and Brazil. The cross-cultural analysis explores the various ways governments handle submerged archaeology and illustrates the need for countries to continue to learn from and share with each other.

## 6A.1 United Kingdom

The United Kingdom maintains a variety of policies and best practice guides aimed at preserving, and minimizing adverse impacts on, its variety of archaeological resources (Peel & Lloyd 2006; Delafons & Delafons 1997). The UK comprises four constituent countries: England, Wales, Scotland and Northern Ireland, where the policies pertaining to the discussion are maintained at these national levels. In England, the governmental organization charged with the responsibilities of overseeing all aspects of the historic and archaeological environment is *English Heritage*, which is ultimately answerable to the Secretary of



State for the Department of Culture, Media and Sport (DCMS). *Historic Scotland* (HS) fills this role in Scotland, and as an agency is answerable to the Scottish Ministers. Cadw, in Wales, is administered on behalf of the National Assembly for Wales. The Northern Ireland's heritage agency falls under a different set of legislation, and is administered by the Northern Ireland Environmental Agency. Scotland's legislation fulfills the same ascribed duties and is devolved under acts by Scottish Parliament, aiming to provide a domestic structure for the promotion, protection and conservation of cultural heritage. Historic Scotland sets out standards with the same basic tenets of preservation, recording, historic and environmental impact assessments, and planning permissions. Because they differ somewhat from English and Welsh heritage guidance, and due to the location of this dissertation's underwater fieldwork in Scotland, Scottish Acts form the focal point for discussion of this policy section. In addition to some of the older and larger pieces of legislation, such as the Ancient Monuments and Archaeological Areas Act (1979), is used in conjunction with the results of the Scottish study. Further, Scotland is on the verge of their referendum vote for independence from or continued union with Britain. As such, using a number of Scottish legislative acts for the focal point of this policy-based discussion and will become relevant to the fieldwork conclusions,

For the purposes of layout and explanation, archaeological legislation in Scotland is divided into four categories in this analysis:

1. Listed sites and monument regulations (The Historic Buildings and Monuments Act (HBMA), 1953; The Ancient Monuments and Archaeological Areas Act (AMAA), 1979; and The Planning (Listed Building and Conservation Areas) (Scotland) Act, 1997), all historically relevant but now unilaterally replaced by the Historic Environment (Scotland) Amendment 2011 (HESA);

2. Development-driven acts (Scottish Historic Environment Policy 2011; Scottish Planning Policy 2010; and the Historic Environment (Scotland) Amendment 2011);
3. Underwater (marine) acts (Marine Act (Scotland); and,
4. International and European Union conventions.

While concerning, regulating and protecting cultural sites, each form of legislative measure works together to provide best protections and management of countrywide archaeological and historical resources. The acts that make up the three strictly domestic categories listed above are overseen by HS, acting on behalf of Scottish Ministers. At the time of writing, the Scottish Historic Environment Policy (SHEP), 2011 is the overarching legislation concerning all aspects of the historic and archaeological environment. SHEP is a policy framework that,

“...Sets out Scottish ministers’ policies for the historic environment, provides greater policy direction for HS and provides a framework that informs the day-to-day work of a range of organisations that have a role and interest in managing the historic environment. These include the Scottish Government, local authorities and the range of bodies that is accountable to Scottish ministers, including Historic Scotland” (SHEP 2011: 3).

Policies of this type are largely designed to be frameworks. They provide direction (Fincham 2008). Like any framework, the forms inside do not always fit perfectly: there are sometimes gaps, excesses, and duplicate forms (Henson, Stone and Corbishley 2004<sup>33</sup>). To a great extent, however, the acts under the SHEP tend to work together with better cohesion and efficiency than laws without an accompanying policy framework (Pater and Oxley 2013).

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<sup>33</sup> Although the authors of this work were not referring directly to the HESA, this statement still stands since frameworks and legislation have complications, regardless of the specific law, policy or act.

## 6A.2 Listed sites and monuments regulations

Until recently, several pieces of legislation constituted the regulation and conservation efforts of listed sites and monuments. It included:

- The Historic Buildings and Monuments Act (HBMA), 1953;
- The Ancient Monuments and Archaeological Areas Act (AMAA), 1979; and
- The Planning (Listed Building and Conservation Areas) (Scotland) Act, 1997.

These acts were combined and replaced by a targeted and inclusive new Act, known as the “Historic Environment (Amendment) Scotland Act, 2011” (HESA). HESA commenced in December 2011. According to HS (2013), HESA is intended to “...harmonise aspects of historic environment legislation with the planning regime; improve the ability of central and local government to work with developers and their partners; and improve the capacity to deal with urgent threats and increase the efficiency and effectiveness of deterrents.” In order to accomplish this, HESA maintains the most relevant responsibilities and targets of the older three acts.

Another tenet of the legislation and resulting practices prior to HESA was to favour *in situ* preservation in lieu of any other active form of investigation, an action that may or may not have actually preserved sites (NPPG5; PAN 42<sup>34</sup>; AMAA; generally, Khakzad and Van Balen 2012). The stated benefit of *in situ* preservation is that archaeological material, after some time, reaches a stage of equilibrium with its surroundings (Muckelroy 1979), although oftentimes an evaluation consisting of a

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<sup>34</sup> NPPG5 is not legislation, technically. It is a guidance note. Similarly, PAN 42 is not legislation, but rather a planning advice note.

basic survey and trial trenching, is the primary means of determining the full character and extent of archaeological remains (Hall and Kenward 2006; Gibbins 1990: 384). This idea of *in situ* preservation rather than active excavation is also a cornerstone of the Valetta Convention<sup>35</sup>, and as such the AMAA was in line with other relevant policy.

The AMAA has many shortcomings, some of which have been responded to by the Joint Nautical Archaeology Planning Committee, English Heritage and the Council for British Archaeology (Bowens et al. 2003). The definition of the term “monument” came under fire, with respondents targeting the phrase’s over-specificity, which they deemed would deter the number of potentially scheduled areas, including those sites underwater<sup>36</sup>. Because the respondents were aware that most of the underwater sites were considered wrecks or war graves, and the term “monument” was not applicable, they assumed that the tight language would prove too restrictive. Submerged landscapes, as well, were not within the protective scope of the AMAA. No provisions for the designation of areas of archaeological potential existed, although there was a designation termed “area of archaeological importance”: a designation for investigation (AMAA 1979). This designation was never bestowed on areas of archaeological interest prior to their submergence in reservoirs in Scotland (Ward 2013). In fact, this designation was only ever given to five locations—Canterbury, Chester, Exeter, Hereford, and York—whose medieval

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<sup>35</sup> The Valetta Convention aims to protect the European Archaeological Heritage, “as a collective memory and for historical and scientific study.” It was formed under the aegis of the Council of Europe and attempts to: remove or mitigate the threat posed by commercial development, identify and protect archaeological heritage, integrate the various types of conservation, control excavations and the use of metal detectors. It further stipulates that any disturbance to a site must be conducted using good archaeological methodology. (Valetta Convention, 1992 Article 3) The United Kingdom is currently lacks the domestic legislation to fully implement it, although it was ratified in 2000.

<sup>36</sup> There were no listed sites in reservoirs.

city centers were threatened by potential development. This provision was never enacted in Scotland and is thus excluded from further exploration.

### **6A.3 Development-driven policies**

A range of different types of planning advice and guidance surrounds the issue of development and planning. Development and planning processes are inclusive of all ground-breaking works, (SHEP 2011; HESA 2011). Planning guidance and advice notes demonstrate best practice and regulatory oversight for developers, farmers, forestry planters, pipeline and utilities builders, road works, and remodeling and reconstruction works in addition to planned dams. In considering planning applications, planning authorities take into account the relative importance of archaeological sites or the potential for archaeological presence, and this is usually accomplished through the writing of written schemes of investigation, desk-based assessments and environmental impact assessments, all impacts and value largely written by commercial companies, with the authorization of a regional archaeologist. SHEP, 2011 is the framework for the acts that underpin the planning process as it relates to historic and archaeological environments (not to be confused with the natural environment). Under SHEP, 2011, planning regulations concerning the historic landscape and archaeology are broken down into Scottish Planning Policy (SPP) 23 and Planning Advice Note (PAN) 2/2011. Section 1.12 of the SHEP, 2011 states that Scottish Ministers want to:

- Realise the full potential of the historic environment as a resource – cultural, educational, economic and social – across every part of Scotland and for all the people;
- Identify the many aspects of our environment and protect and manage them in a sustainable way to secure their long-term survival and preserve their embodied energy;

- Understand fully all aspects of the historic environment, and their condition and inter-relationships;
- Broaden access to the historic environment and break down intellectual, physical<sup>37</sup> and economic barriers;
- Ensure that effective systems underpinned by appropriate legislation and information are in place to conserve and manage the historic environment.

Within all of these aims, there is an inherent potential for applicability to submerged archaeological resources (Ward 2009). In "realizing the full potential", submerged archaeological sites and how to better understand and utilize them as cultural resources (i.e. whether for tourist revenues, places of archaeological or cultural importance, or for further study) are considered. Nevertheless, they are not. However, they should be, because those sites' submergence in reservoirs is the direct result of a type of development, which is why development-based policy should apply to features in reservoirs (and to those features that have the potential to be flooded by reservoirs).

The second aim of "identifying the many aspects of the environment and protecting and managing them in a sustainable way" is not happening in regards to submerged resources, despite the literature that suggests that reservoirs are destroying certain types of archaeological data. Both new dams and old dams impact archaeological features, and this understanding is what is lacking; this lack of recognition and protection fosters in an archaeological landscape that is fleeting and closer to destruction (Ward 2009). The third aim focuses on holistic understanding of the historic environment, although one may see a contradiction in that the reduced awareness and understanding of reservoirs and their related submerged resources presents a significant gap in this understanding. Broadening access and breaking

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<sup>37</sup> By providing easier access to a variety of sites through awareness programmes, accessibility features for visitors with disabilities, and clear, improved access paths to sites (SHEP, 2011).

down barriers will require more comprehensive understanding, protection and targeted study or visitation of resources in reservoirs. Once a site is known and understood, it can be opened for public access, where members of the local community and visitors can continue to enjoy that resource and engage with it on a personal level. Finally, in ensuring that effective systems are underpinned by appropriate legislation, the government must consider and include submerged sites on their registers of 'listed' sites and places of archaeological interest or consideration. This change could manifest as either a written change to laws and policy, or as a change in the practice: changing the intent. Politicians and archaeologists could unanimously decide to include submerged features without a change in the legal status. The likelihood of that change, however, is limited given the current status quo. Without the consideration of submerged resources in each of these aims, the Scottish Government omits 323km<sup>2</sup> worth of potentially archaeologically rich areas (Scottish Natural Heritage, 2003). This equates to 0.41% of the total landmass of Scottish mainland alone (Scottish Natural Heritage, 2003).

As per Section 1.12 of the SHEP, 2011 “Every part of Scotland” includes those areas within reservoirs. “Identifying, protecting and managing” therefore applies to archaeological resources in reservoirs. Understanding their “condition” and providing “physical” access to them, while ensuring “appropriate legislation” are also aspects of the SHEP 2011 vision that are applicable to submerged resources. Section 1.15d of the SHEP specifically demands that this takes place, stating that there is a need to “ensure that what is to be conserved is properly recorded before and, if necessary, during and after work.” Other aspects of the planning process, such as SPP 23 (Planning and the Historic Environment), which supersedes and

consolidates the National Planning Policy Guidelines, and PAN 2/2011 further discuss development and provide more detailed explanation and guidance. SPP 23 sets out the “national policy for the historic environment, emphasizing protection, conservation and enhancement” in Scotland (SPP23, Consultative Draft, 2008). Like many of the policy planning documents, a clear emphasis rests on developer awareness of archaeological resources, their finite and sensitive nature, and a willingness to take mitigation measures early in the planning process (SPP23). This directly relates back to the issue of dam construction. If dam developers and engineers are more aware of archaeological resources, long-term mitigation and management plans can be implemented early in the dam construction and planning phases, meaning that in the future, the question of how to best protect resources in dams will not longer be a question of policy approaches. Rather, it will already be a best practice guideline.

PAN 2/2011 provides a renewed emphasis on the importance and sensitivity of archaeological resources, and details the requirements and process of archaeological planning clearance, permissions and possible excavations, recordings and/or mitigation measures. Where possible, developers and archaeologists should prefer *in situ* preservation, although PAN 2/2011 asserts that when plans cannot undergo adjustment, a certain or full amount of archaeological investigation is the necessary and appropriate action. Regarding the discovery of archaeological resources during development, Section 31 of PAN 2/2011 states:

Even following the best pre-planning application research, there may be occasions when the presence of archaeological remains becomes apparent only once development has commenced. In these circumstances, the local authority archaeologist should be informed immediately, and will be able to offer practical advice on the mitigation measures which should be applied by the developer to



ensure appropriate excavation, reporting and analysis if preservation in situ cannot be achieved.

Further to this, section 35 of PAN 2/2011 states that:

...Developers should be prepared to undertake appropriate excavation and/or recording before and/or during development, and to support consequential analysis, publication and archiving of the results...

These acts are not *lex post facta*<sup>38</sup> but their applicability as *ex post facto* is irrelevant, because the archaeological remains persist, *in situ*, and are therefore still worth post-development recording and analysis. This policy that requires payment or management by the party who is causing deleterious effects through their actions, also applies to the long-term management of damaged features in the years after physical development has ceased. In the years after dam construction, when the reservoir is still having a constant effect on archaeological features, then it is apparent that the development's effects are not over (simply on the basis that construction on that development have ceased). One potential means of enforcing this longer-term management is through the *lex post facta* nature of PAN 2/2011. As Section 31 describes, new measures that are to be undertaken following the development of sites rather than penalizing developers for previous action, the issue of *lex post facta* is still fairly irrelevant. There is a clear trend of identification of archaeological features post-inundation, suggesting current legislation is affecting little monitoring or mitigation measures in reservoirs, reservoir surrounds<sup>39</sup>. This is illustrated by the confirmed location of cairns, burnt mounds, cists, mottes and

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<sup>38</sup> *Post Factum* laws are retroactive.

<sup>39</sup> The inundated sites are not alone in this. The bulk of Scottish monuments are currently neglected and thus are often subject to accelerated degradation (Scotland.gov 2011).

standing monuments<sup>40</sup> in the draw-down zones and in the permanent conservation pools in the reservoirs studied in this dissertation in Scotland. Known instances of archaeological sites, and ones that are specifically at risk, have remained unscheduled in status, with no requirement or pressure for study in the years subsequent to the dams' constructions, neither from the planning framework, nor from any of the other frameworks at work in Historic Scotland or the RCAHMS (Ward 2010; Cunliffe, DeGruchy and Stammitti 2012).

Despite the Scottish Government's creation of the new SHEP, HESA, SPP 23, PAN 2/2011 and the circulars that provide extra advice and guidance for the present and future of planning and development in Scotland, the Scottish Reservoir Act 2011 (RA2011) which was planned and written at the same time as the SHEP, contains exclusionary clauses related to archaeological heritage. The RA2011's primary purpose is to provide legislation for reservoirs, thereby revising the duties of engineers, logistics of managing dams and their risk management processes, and redistributing management duties and powers of Scottish Ministers with regards to flood prevention and restorative measures and Scottish Environmental Protection Agency (SEPA) related requirements and duties (RA2011).

The history of acts regarding dam construction and reservoir creation excluding cultural resources dates to the Development (Scotland) 1943 legislation, under which dam works were completed under the powers of the Secretary of State for Scotland (Payne 1988). Payne (1988 45) observes (in the context of the tasks for the North of Scotland Hydro Electric Board) that as outlined in the 1943 bill, "The

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<sup>40</sup> This list is not extensive of the number or types of submerged resources in the Scottish reservoirs studied in this dissertation, let alone the reservoirs in greater Scotland. Other submerged resources include archaeological landscape, industrial archaeology, medieval and post-medieval sites, and mesolithic and neolithic areas of importance.

first task was to prepare a general scheme or survey of the water power resources which it proposed to examine with a view to their possible uses for the purposes of generating electricity. This ‘development scheme’ was to be submitted to the Electricity Commissioners for their approval on technical grounds and then to the Secretary of State for confirmation.” In this context, the approval for the scheme comes from the Secretary of State, and his powers of direction come with that authority (he delegated responsibility for the development and his powers to the board). Ministerial direction of this type can mean that consents are not required in the usual manner, particularly not in the case of issues related to archaeological and cultural heritage (Payne 1988). The Land Registration Act of 1979, in the context of the historic environment, provides examples of provision for this type of ministerial direction<sup>41</sup> (Short and Winter 1999). In neither of these two individual schemes, was there a required clause related to cultural heritage preservation, and the acts, as they were being developed through the Secretary of State’s power of direction, allowed abuse of land management and building efforts (Payne, 1988). This precedent puts the future of the historic and archaeological environment at risk, especially with increasing pressure on Parliament to subsidize wind farms and hydro projects<sup>42</sup> in Scotland (Davies 2007; Lillie et al 2007; Howard et al 2008; Copestake 2006; Shaw 2003). While little exists of the workings of the RA2011, due to the limited time between its passage and the writing of this work, one can only hope that past precedent does not continue, and that the RA2011 does not permit the same types of exclusions as the pre-2011 acts.

However, parliamentarians have not only declined to address the issues

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<sup>41</sup> Bearing in mind that this was a wartime act, whereas current exclusionary acts are not undertaken at a time war.

<sup>42</sup> Such as the Glasa Hydro Scheme (Coire Glas) and Langhope Rig Windfarm.

surrounding long term maintenance or monitoring in the RA2011, but they have also not brought this issue to the fore outside of Parliament. Representatives from HS attended the SR Hydro Conference in Perth in May, 2013, and those representatives made no effort to raise the issue of archaeology in reservoirs, whereas dams as pieces of industrial archaeology were a clear priority (also evidenced by the HS publication, "Power to the People: the Built Heritage of Scotland's Hydroelectric Power"; see Fleetwood, 2010).

Interviews were held with one anonymous source from HS and David Fleetwood, of HS, (May 8, 2013). Both interviews indicated a level of dissatisfaction with the current status of Scottish policy aimed at the protection of archaeological resources. The anonymous source from HS was asked for general feelings and concerns regarding submerged heritage, and feelings of content or dissatisfaction with the planning and conservation process. Anonymous replied, "In the case of large-scale development, or Parliament-backed schemes, exclusionary policies are written into development plans. Those policies then curtail the effect of discovered archaeological heritage's presence on a project's permissions" (May 8, 2013). When asked to clarify the meaning of this, the response was, "I have observed instances when, with some types of planning, things deemed of benefit to the local community, archaeological heritage and even built structures with some importance to them, are utterly ignored in lieu of progress" (May 8, 2013). The anonymous HS source noted that a good primary example of this discounting of archaeological or other heritage concerns is written into the Edinburgh Tram Act (ETA), 2006 (May 8, 2013; ETA, 2006). Section 73.1—8 details the permissibility of disturbance around and to listed buildings and scheduled monuments (ETA,

2006). Section 73 grants developers the permission to make changes up to and including the demolition of listed buildings, if those buildings interfere with construction works associated with the installation of the tramlines. Monuments and building unlisted within the confines of Section 10 of ETA, 2006 receive no special protections, with Section 73 explicitly rescinding any and all of the protective acts applied to historic structures.

The other interviewee, David Fleetwood, when asked the same question about feelings of the planning process and conservation responded, "Conservation is not always possible, and there are times when it is deemed out-with the project's objectives altogether" (May 8, 2013). Dr. Fleetwood suggested the author seek further evidence of exclusionary policies in the previously mentioned ETA (2006), as well as the impending "Glasa Scheme", a newly approved hydro project planned for a location near Ardross in the Scottish Highlands.

Substantiation of this attitude of exclusion through policy is evident in the "Glasa Scheme", though it could have renovated the ways in which Scotland handles archaeological resources threatened by certain types of development. Barring that, it could surely have paved the way for a new type of submerged heritage management. However, the opposite happened in practice. The "Glasa Scheme" holds minimal requirements for pre- and mid-developmental archaeological management (Ash Design and Assessment, 2012). Although the project is likely to have effects on a "number of features ... and a number of previously unrecorded archaeological sites", the project was still approved with no requirement for longer term follow up in what will become another reservoir with a number of known and unknown archaeological sites (Ash Design and Assessment, 2012).

These exclusionary policies do not bode well for the future of Scottish archaeological heritage, least of all, any political or industry-based push for recognition of submerged resources. The author attended all renewable conferences, held from 2012-2013, and found herself the sole representative of the submerged heritage sector at one conference (at which staff from HS were present and consequently interviewed), and the sole representative of the cultural heritage and archaeology sectors at the rest<sup>43</sup>. One representative from the British Dam Society (of the 13 contacted) agreed to an e-interview about the subject, on the condition that anonymity would be maintained.

The British Dam Society representative was asked (via email) how he reflected on the British Dam Society's role in managing cultural heritage resources, and how he had perceived his role as a professional engineer in the process. His electronic response was as follows:

"Dams must be built and of course they'll have an effect on people and the environment. In some cases, there's archaeology that needs to be saved or considered. Dam engineers need to consider this stuff, these 'softer issues', and try to communicate with the people on the ground as soon as possible to try to implement changes to save things. But these are softer issues. The bigger issue is providing clean, regular water and power to people. Environmental compliance is required and therefore met, but heritage agencies are 'soft' and so the entire industry neither wants nor needs to accept it as anything other than a tertiary priority, at best " (October 27, 2012).

This statement illustrates a potentially prevalent attitude from within the hydro-industry and if this is the prevalent attitude, the course of actions leading to little emphasis on submerged heritage in related policy documents, planning procedures and heritage law becomes unsurprising. This latter sentiment, while

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<sup>43</sup> Of five conferences attended.

purely author speculation, cannot be further expanded upon due to the refusal of Scottish Water, the British Dam Society and other stakeholders to make a statement on the issue.

## 6A.4 Underwater Acts

The welfare of maritime and marine heritage along the UK coast has long undergone very little protection or recognition. The new "Marine Act (Scotland) 2010" (MAS) bill, which came into effect in December 2010, ushered in a new era of marine protections along the Scottish coastline. The MAS succinctly addresses and unifies many of the elements of the past pieces of marine legislation, by emphasizing conservation and scheduling-based approaches to all aspects of marine and coastal development. It legislates for strict licenses vis-à-vis the natural heritage and wildlife associated with all of Scotland's seas, and imposes sanctions and fines on impingement. However, the new act sets explicit definitions for those areas to which it applies: the "Scottish Marine Area" and the "Sea". The MAS defines the "Scottish Marine Area" in Part 1, 1 of the Act as,

- a. "For the purposes of this Act, the "Scottish marine area" means the area of sea within the seaward limits of the territorial sea of the United Kingdom adjacent to Scotland and includes the bed and subsoil of the sea within that area.
- b. The boundaries between the parts of the territorial sea of the United Kingdom adjacent to Scotland and the parts not so adjacent are to be determined by reference to an Order in Council made under section 126(2) of the Scotland Act 1998 (c.46) to the extent that the Order in Council is expressed to apply for the purposes of that Act."

And defines the "Sea" in Part 1, 2 of the Act as,

- a. "any area submerged at mean high water spring tide;

- b. the waters of every estuary, river or channel, so far as the tide flows at mean high water spring tide.”

Therefore, sites in reservoirs unambiguously do not qualify for any protections or status under this Act. The earlier marine-based policies did not provide any specific set of protections for archaeology in reservoirs either, but it does provide a good basis for starting a reservoir-dialogue and provide potential policy gaps into which new legislation could fit (Merchant Shipping Act, 1995; Protection of Wrecks Act, 1973).

Before the MAS, the coastal and marine heritage came under the jurisdiction of the "Merchant Shipping Act, 1995", which was brought into action after the "International Convention on Salvage, 1989". This represented a modernization related primarily to the commercial salvage sector, transcending (but not changing) the 18<sup>th</sup> and 19<sup>th</sup> century common laws related to the concepts of “derelict” and “salvor in possession”. In a response to a revised system for marine archaeology, spearheaded by English Heritage, the Joint Nautical Archeology Policy Committee (JNAPC) (2004 23) notes that, “‘voluntary’ salvage, where the salvor does not act under a contractual obligation and which is the normal case in maritime archaeology, retained most of its essential characteristics”. The case of *Morris v. Lyonesse Salvage Company Ltd., 1970* played an integral role in shaping the meaning of salvage in regards to maritime archaeology. *Morris* set the precedent for archaeologists to act as “salvors in possession”, enabling them to acquire possessory right, enforceable against the world, and incidentally, the Crown).

It was the first time that archaeological investigation held this right, as the laws had earlier been used on behalf of commercial salvage operation, but in this breakthrough case another precedent was set: for the first time, the court accepted



possession of a site that included a vessel, the remains of which were scattered, and not in the form of substantial remains or one large segment (et al. 2003; *Morris v. Lyonesse Salvage Company Ltd. 1970*). The importance of this case cannot be overstated, as the "Protection of Wrecks Act, 1973" (PWA), requires the publication of a site's location, but through this possessory right, archaeological sites gain and retain protection prior to designation (Bowens et al 2003).

Salvage thrusts into light a critical aspect of archaeological site management since elements of voluntary salvage are retained. Services provided *ex contractu* are preserved in the *International Convention on Salvage, 1989*. As et al. (2003: 7) points out, "Freedom to initiate salvage means that archaeological material can be lawfully recovered when some in the archaeological community may argue that it would have been more appropriate, from a 'heritage perspective', for it to have been preserved *in situ*." There is the added potential consequence that museums may ultimately be faced with "unsolicited offers of archaeological material which they lack the resources to conserve and curate" (Bowens, et al. 2003 7). Flatman (2007), Bowens et al (2003), and Ransley (2007) share these conclusions, but application has not yet found its way to archaeology sites in reservoirs.

Other nations' courts (e.g. Canada) have found that there exists a real threat<sup>44</sup> to the wrecks when salvage is the preferred method, due to the lack of "...justifiable basis of the threat of physical danger" (Gibbs 2006; Harris 1997; Hutchison 1996). Archaeological vessels and sites tend to reach an equilibrium when left *in situ* but the resources in reservoirs are left without the jurisdiction and monitoring afforded deeper sea derelict vessels (Bowens, et al., 2003, p7). Archaeological resources in

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<sup>44</sup> For more about the threats to unprotected wrecks subject to salvage, please see Gibbs, 2006; Harris, 1997; Hutchison, 1996;

reservoirs are just as easily accessible, due to the high volume of sports and recreational divers in addition to the possibility of water levels lowering sufficiently to pique the attention of walkers or passers by, as intentionally sought and oft ambiguously located wrecks. Sites in reservoirs are just as likely to hold rich artifact assemblages as the typical shipwreck (BAG, 2013) and should therefore affect similar and equally protective legislation and designation.

The PWA was in many ways akin to the ETA and the RA2011, in that it authorizes the Secretary of State to designate restricted areas or areas of special importance. In this instance, it applied to those areas where wrecked remains of a vessel that are of historical, archaeological or artistic importance, although further general guidance to designation was published under the AMAA. Although it authorized no provision for expenditures or allow for the designation of areas of archaeological potential, it did benefit from a type of dispute settlement mechanism: the Advisory Committee on Historic Wreck Sites (ACHWS)<sup>45</sup>, which provided impartial advice to all stakeholders. The AMAA, infrequently used for sites below the low water mark, allowed the scheduling of monuments in a more flexible way than the PWA, in that it offer applicability to flooded landscapes (Dromgoole 1999). Its historic use underwater was difficult due to the definition of “monument”. The AMAA defined “monument” as:

- a. “Any building, structure or work, whether above or below the surface of the land, and any cave or excavation;
- b. Any site comprising the remains of any such building, structure or work, or of any cave or excavation;

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<sup>45</sup> Set up as a part of the PWA, and now functioning under the auspices of English Heritage.

- c. Any site comprising or comprising the remains of any vessel, vehicle, aircraft or other moveable structure or part thereof which neither constitutes nor forms part of any work which is a monument within paragraph 'a' above."

The inclusion in *HESA* of the term "deposit" allows a wider definition and application: "remains and objects and other traces of mankind from past epochs" as a part of the archaeological heritage. Although both "monument" and "deposit" would achieve full applicability to sites in reservoirs, "deposit" allows applicability in the circumstance of flooded landscape; which is what archaeological features, sites and valleys are, once inundated by reservoirs.

Given the clear evidence of the number and variety of types of mechanisms and policies that could be applied to submerged resources, and the lack of applicability, in either theory or practice, of these mechanisms represents a serious deficiency in the British legislative system. The current legislative system attempts to conserve and promote awareness of many types of historic and archaeological landscape, as well as features and building. At the moment, there remains no funding for the further analysis and understanding of submerged resources, no political will to investigate or protect these areas, nor any particularly convincing evidence that the hydro-industry will start promoting and funding the protection of sites without legal or planning requirement. The very agents and professionals that are meant to represent HS and professional engineering bodies display both discontent with the system as it is and a lack of understanding of the sites in reservoirs. Yet, little change and awareness is happening: neither in the real practice of commercial planning (in archaeology) given the exclusionary clauses that are written in for convenience, nor in a push for awareness, protection or even recording

of features at the edges of reservoirs. Both the SHEP and HESA seem prime candidates for the furtherance of bringing awareness of submerged resources to the fore, but how they will manifest this awareness or change, given their limited applicability to submerged resources, will become evident in time.

## **6A.5 Britain's Obligations under International & European Conventions**

Significant discrepancies exist in British legislation, despite Britain's great potential to satisfy her obligations under several International and European Conventions. The list of conventions to which Britain is a signatory is long. Those that are most applicable to submerged resources, and to which Britain is a signatory, are the European Convention on Human Rights (ECHR), the Valetta Convention, the Florence Convention, the Paris Convention of 1954, and the Faro Convention on the Value of Cultural Heritage for Society.

The ECHR came into effect on September 3, 1953, with the United Kingdom acting as a founder signatory. Originating in the European Council (not the European Union), it received direct applicability in the United Kingdom by the passage of the British Act, the Human Rights Act, 1998. The author does not argue that the act of archaeological and cultural heritage resources submerged in reservoirs poses a threat to human rights, but rather the sustained and lackadaisical shortage of monitoring or awareness, paired with the British exclusion of cultural resources when deemed 'important' may cause a breach of these self-delineated obligations. The ECHR poses two

provisions that are directly relevant to application in the archaeological heritage management sector: Articles 1 and 6. Article 1 states,

"Every natural or legal person is entitled to the peaceful enjoyment of his possessions. No one shall be deprived of his possessions except in the public interest and subject to the conditions provided for by law and by the general principles of international law. The preceding provisions shall not, however, in any way impair the right of a state to enforce such laws as it deems necessary to control the use of property in accordance with the general interest or to secure the payment of taxes or other contributions or penalties."

The relevance of Article 6(1) of the Convention, in so far as it is relevant, states that "in the determination of his civil rights and obligations ...everyone is entitled to a ... hearing ... by [a] ... Tribunal." Bowens et al. (2003 29) remarks that Loveland, "in his review of the compatibility of the United Kingdom's land use planning system concluded that ' ... there is little scope to argue that development control decisions do not fall within Article 6...'" Because Article 6 requires a set of procedural standards in the determination of civil or criminal matters, these standards also apply to designation and scheduling, and the granting or refusal of granting proprietary or possessory licenses. Therefore, as a determination of civil rights and obligations, Article 6 applies. Further, the

"Scheduling of terrestrial monuments has traditionally been regarded as a component of the Town & Country Planning system, along with designation of Conservation Areas, SSSI's, Areas of Outstanding Natural Beauty and National Parks and the listing of buildings. If scheduling is regarded as falling within Article 6 on land, and there seems little doubt that it does, there would be no logic in regarding scheduling in tidal waters as not doing so<sup>46</sup>"(ibid).

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<sup>46</sup> For further discussion, see Loveland, I. "The Compatibility of the Land use Planning System with Article 6 of the European Convention on Human Rights" JPL (2001) pp.535-547

Loveland's remarks are critical to the applicability of these provisions to those archaeological features in reservoirs. If sites below the low water mark are included in this discussion, reservoirs -land-based but marine in function- must also be included.

The SHEP, HESA and MAS that have replaced the earlier marine and terrestrial heritage acts, with this 1998 Human Rights Act in mind, represents greater compliance of the UK to the ECHR. Earlier doctrines simply were not formulated with convention requirements in mind. The 1998 Act bound Britain to the terms of the ECHR, and as such, new constraints and obligations on heritage agencies will continuously need to be taken into account at the domestic level. Given the lack of legislation passed at the domestic level that could have handled submerged resources, the level of compliance in monitoring and 'safeguarding' submerged resources is yet to be seen. Britain's progress and increased compliance with the ECHR holds no promises for reservoirs, which remain a grey zone of jurisdiction.

#### The Florence Convention (European Landscape Convention) 2000

Britain is also a signatory of the 2000 European Landscape Convention (Florence Convention). According to English Heritage, the signatories to the Florence Convention "agree to recognise 'landscapes' in law as 'an expression of the diversity of their shared cultural and natural heritage, and a foundation of their identity'. These recognised landscapes are then to be subject to policies for their management, amongst other obligations" (English Heritage, 2013). It stands to reason then, that Britain is under obligation to manage landscapes and designate 'recognised' landscapes.

For the purposes of the Florence Convention," 'landscape' means an area, as perceived by people, whose character is the result of the action and interaction of

natural and/or human factors" (Florence Convention, 2000). In Scotland, it is the joint responsibility of Scottish Natural Heritage and HS to provide guidance to regional and local authorities that are then responsible for special landscape designation. These special landscape designations compliment "national scenic areas": landscapes deemed by HS, English Heritage or CADW, where regionally appropriate to be of national importance. There are 40 national scenic areas in Scotland, accounting for 13% of the total island and mainland landmass of the country (Scottish Natural Heritage, 2013). None of the areas of national scenic designation are in reservoirs, though many of the special landscape designations (local designations) overlap reservoirs. Their designation includes land at or above the reservoir's high water mark (Scottish Natural Heritage, 2013). A simple change in designation-area boundaries may provide the increased awareness and protection that submerged resources need, although such a change would only include the drawdown zone. Nevertheless, submerged resources in that zone are the most threatened, and any move toward monitoring and protection would undoubtedly assist in their preservation.

#### Valetta Convention

The Valetta Convention, passed by an act of the European Council<sup>47</sup>, represents a dramatic change in perceived threats to archaeological and other cultural resources. The earlier Convention on the Protection of Archaeological Heritage, 1969 highlighted clandestine excavation as a primary threat, whereas the revised

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<sup>47</sup> The Treaty entered into force with four ratifications on 25th. May 1995. The United Kingdom ratified in September 2000 and the Convention came into force in the UK in March 2000. As of 23rd. September 2002 the following States have ratified: Andorra, Azerbaijan, Bosnia and Herzegovina, Bulgaria, Cyprus, Czech Republic, Estonia, Finland, France, Georgia, Hungary, Ireland Liechtenstein, Lithuania, Malta, Moldova, Norway, Poland, Portugal, Romania, Slovakia, Slovenia, Sweden, Switzerland, Turkey and the United Kingdom. Additionally, 13 States have signed but not yet ratified, including Croatia, Denmark, Germany, Greece, Italy, Netherlands, Russia and Spain. See further <http://conventions.coe.int>

Valetta Convention shifts this danger onto large-scale, commercial construction operations. This results from the greater paradigm shift originating in the 1980's across the heritage management disciplines: the switchover from prioritizing investigative techniques to in situ management. The Valetta Convention is a reflection of these values.

The Valetta Convention applies directly to archaeological and cultural resources in several ways, and promotes a new way of thinking about cultural resources. This applicability to reservoirs is in Articles 4, 7 and 9.

Article 4 of the Convention states,

“Each Party undertakes to implement measures for the physical protection of the archaeological heritage, making provision, as circumstances demand:

-for the acquisition or protection by other appropriate means by the authorities of areas intended to constitute archaeological reserves;

-for the conservation and maintenance of the archaeological heritage, preferably *in situ*.”

Article 7 of the Convention continues in this vein, asserting the following:

“For the purpose of facilitating the study of, and dissemination of knowledge about, archaeological discoveries, each Party undertakes:

-to make or bring up to date surveys, inventories and maps of archaeological sites in the areas within its jurisdiction;

-to take all practical measures to ensure the drafting, following archaeological operations, of a publishable scientific summary record before the necessary comprehensive publication of specialised studies.”



The final area for full compliance with the Valetta Convention lay within Article 9. Under Article 9, each Party undertakes to:

“To conduct educational actions with a view to rousing and developing an awareness in public opinion of the value of the archaeological heritage for understanding the past and of the threats to this heritage”

In order to remain in compliance, both conservation and maintenance efforts should start to take place in reservoirs, especially in instances of known and documented heritage presence (discussed in Chapter 6: Analysis). Compliance to Article 7 is not difficult, but in striving to do such, the UK would need to bring survey and monitoring of reservoirs, as elucidated to, in the bringing up to date of surveys of those archaeological areas.

While initial reading of Article 9 suggests that the UK is in full compliance with this provision already, emphasis should stem from “...understanding the past and threats to this heritage” (Article 9, Valetta Convention, 1992). Through a continued dismissal, whether intentional or by oversight, a lack of provisos concerned archaeology in reservoir and a continued push to develop public awareness and commit to maintenance of those flooded resources through monitoring in the post-dam stages, the UK only partially complies with Article 9.

#### Faro Convention

Proactive attempts at monitoring, surveying and recording in reservoirs are a quintessential element of the Faro Convention on the Value of Cultural Heritage for Society, 2005<sup>48</sup>. The Faro Convention prompts a need for and emphasis on

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<sup>48</sup>The Faro Convention defines cultural heritage as “a group of resources inherited from the past which people identify, independently of ownership, as a reflection and expression of their constantly evolving values, beliefs, knowledge and traditions. It includes all aspects of the environment resulting from the interaction between people and places through time”.

understanding and valuing all aspects of the environment that result from the interaction between people and places (Faro Convention, 2005). Reservoirs certainly fit this description. From the discussion that prompted this section, it is clear that Britain does value aspects of the environment and its cultural resources. However, the Faro Convention makes clear in Article 4c that, the "exercise of the right to cultural heritage may be subject only to those restrictions which are necessary in a democratic society for the protection of the public interest and the rights and freedoms of others". The current lack of monitoring and information related to submerged resources in Britain qualifies as a restriction of the public from those resources: resources that are cultural, potentially key to local identities or pasts, and resources that are under constant threat of destruction in a nation that has yet to do anything about it. For these reasons, Britain is not in full compliance with the Faro Convention.

## **6A.6 Gaps and inconsistencies**

The current system of policy and best practices in the UK, focusing on those discussed in Scotland, present a range of complex and potentially effective systems for conserving the archaeological and historic past. Terrestrial sites that have been scheduled, as well as those sites facing development, are subject to close scrutiny, despite the specific exceptions enacted by the Secretary of State. That sites and landscapes underwater have received so much attention through the MAS and its predecessors, it is obvious that these types of sites are considered valuable archaeological resources in our current milieu. The renewed interest expressed through the publication of best practice guides and reviews presented by HS and the

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RCAHMS sets the *mise-en-scène* for those features that are submerged in reservoirs to start receiving the recognition, cohesive and location-specific legislation, and best practice guidelines.

Of course, reservoirs are unique places in that they are essentially the culmination of all three types of sites discussed in the current legislative regime; they are at once, terrestrial, the subject of planning and development, and now underwater. Therefore, that there is no proviso for them is somewhat unsurprising. Policy simply has not caught up with the impact on the environment. This realization puts the UK in a strange position, because the discovery of any archaeology, even post-development stage, is subject to the same laws and requirements of European Council Conventions. It is possible that reservoirs, like many other developments (environmental as well as socio-political) represent a new dimension for fresh policies and best practices across the whole of Britain. The next section examines the United States to determine if Britain's common law ally has addressed the issue in a similar manner.

## **6B.1 Policy in the United States of America**

Where Britain faces a set of obligations put upon her by acting as a state party to the European Union, the European Commission and as a smaller set of countries working together under one (British) Act of Union, the United States of America is not party to the same spectrum of regulations. However, the US comprises a different set of cultural resource laws and practice enforced at the Federal level and then acted upon by State and local (regional) offices, with priorities centered on institutions such as the *Native American Graves Protection and*

*Repatriation Act (NAGPRA)*, the *National Environmental Policy Act (NEPA)* and Section 106 of the *National Historic Preservation Act (NHPA)*. American cultural resource management (CRM) is fraught by a lack of clear distinction between archaeological resource and cultural resource, and the lack of comprehensive treatment of cultural resources in land use and development planning. This phenomenon, Dr. Thomas King (2004: 10) suggests, has led to the equation of cultural resource management with narrower practices, such as applied archaeology, leading to communication problems– leaving already-submerged resources largely ignored. It might be illustrated by the means through which American cultural resource management is governed, a system that is not split legislation on the basis of development areas, the marine environment or preservation, but rather through a system that utilizes different authorities to oversee different laws altogether. The Federal Government is responsible for setting overarching laws and regulations about the nature of cultural resource management (CRM), with responsibilities and duties overseen by the US Army Corps of Engineers, the US National Parks Service (NPS), and the National Environmental Protection Agency (NEPA). State-level engagement, along with local authority, is through civil service positions, occasionally allocated through the NPS, NEPA, the State Parks Services and a host of regional museum and city parks divisions.

The Reservoir Salvage Act (now called the Moss-Bennett Act) provides the oversight to resources in reservoirs and it is in its clause within the US Code (Title 16, Chapter 1A, Subchapter 1, section 469) that archaeological and cultural resources are addressed. Before further discussing the Moss-Bennett, the laws that led to its

formation, and how even this targeted piece of literature is still lacking, a general overview of the state of CRM in the USA is provided.

While British policies are grouped broadly into differently functioning types of laws, American CRM is specifically divided into an extensive list of authoritative agency divisions, sub-divisions and their relevant bodies of legislation for which they are responsible. The extensive list of authorities and legal documents are part of a longer history of historic preservation guidance. In 1916, the USA passed the Antiquities Act of 1906, which ushered in the creation of the National Parks Service in 1916: the first agency with the sole mission of conservation of natural and cultural resources in the USA, Roosevelt's "New Deal". Its primary mission was to make work for the poor and unemployed during the Depression Years, involving a large number of construction projects, which in turn led to the growth of the CRM industry and the passing of a further set of laws and historic preservation acts, as more groundbreaking construction works came underway (MacKintosh 1999). The idea of preservation in urban planning and making neighborhoods a focus for cultural concern and action were emphasized by the creation of historic districts (rather than single historic buildings or monuments), through the bold acts of local governments (e.g. the Vieux Carré in New Orleans) (King 2004).

The post-war years saw the creation of the interstate highway system, and at the alarming rate of construction, the NPS and Smithsonian Institute lobbied for the creation of a series of archaeology salvage programs to save cultural resources with the assistance of the Army Corps of Engineers, who were responsible for the construction of the highway systems and the large dams and reservoirs characteristic

of this era (King 1999). Out of the NPS lobbying, the Reservoir Salvage Act/Moss-Bennett was created, followed in short order by the National Trust for Historic Preservation. NEPA came into force in 1969, as a combined effort at managing the environment, and requiring agencies to consider the effects of their actions on the quality of the human environment (NEPA 2012). Although the US Government began to recognize the cultural heritage of Native American cultures in the 1960's, NAGPRA was not passed until as recently as 1990, which included the protection of Native American remains in reservoirs.

Of the laws passed over a two hundred year history, only the Moss-Bennett, discusses with any clarity, the role of the government to intercede in and manage cultural (archaeological) resources soon to be inundated by reservoir waters. However, the Moss-Bennett Act holds no provisions for site degradation or long-term monitoring once the reservoir is full and the archaeological features or historic landscape is submerged, although the Act does have the potential for retaining such a clause.

The Moss-Bennett Act is not the only act that has the potential to define and mitigate long-term effects. Section 106 of the National Historic Preservation Act of 1966 also provides a legislative gap in which requirements for long-term reservoir effects for mitigation or monitoring could fit. NEPA, which considers the human environment holistically, may also prove useful in this dialogue, and its implications are also discussed.

**6B.2 Three titles, one act: “Reservoir Salvage Act of 1960”;  
“The Moss-Bennett Act”; “The Archaeological and Historic  
Preservation Act 1974, as amended”**

The Moss-Bennett represented a turning point in CRM. For the first time in the US or anywhere in the world, the effects of construction works (on archaeology) enacted by the federal government were damage controlled. It was also among the first programs among the forthcoming, worldwide wave of salvage archaeology programs (King 1999). In many ways, the Moss-Bennett (at that stage, the reservoir salvage act) was the archetype for the archaeological salvage programs that were subsequently formed and undertaken on behalf of UNESCO in the later 1960's and early 1970's (see King 1999; Fowler 1982; Hassan 2007). Unfortunately, neither the passage of the law in its original form in 1960, nor the amendments to it that reestablished it as the Moss-Bennett Act, provided any provision for long term monitoring of archaeological material or follow up studies of reservoir inundation effects on the cultural heritage health of that area at large (NPS.gov). The expanded Moss-Bennett Act did include provisos for the longer-term management and care of the collections that derived from the initial salvage works, and this was at least a step in the right direction for the archaeological, if not other forms of cultural heritage. These archaeological collections will, minimally be managed and protected, whether in archives or museums, whereas other forms of the cultural record (i.e. landscapes, archaeological features and remains that were left *in situ* or not recorded or recognised, and places of cultural value) will not be protected or monitored.

The Moss-Bennett reads,

“It is the purpose of sections 469 to 469c–1 of this title to further the policy set forth in sections 461 to 467 of this title, by specifically providing for the preservation of historical and archeological data (including relics and specimens) which might otherwise be irreparably lost or destroyed as the result of:

(1) Flooding, the building of access roads, the erection of workmen’s communities, the relocation of railroads and

highways, and other alterations of the terrain caused by the construction of a dam by any agency of the United States, or by any private person or corporation holding a license issued by any such agency or  
(2) Any alteration of the terrain caused as a result of any Federal construction project or federally licensed activity or program.

The phrase, “alterations of the terrain caused by the construction of a dam”, is applicable to the changes that have occurred in and are occurring in cultural and archaeological landscapes in reservoirs. Discussion on the part of McGimsey (1980) suggests that the original bill may have included aspects that touched upon the issues of longer term monitoring. McGimsbey, co-writer and primary lobbyist of the bill that became the Moss-Bennett notes with dissatisfaction that, “To the surprise to those of us who had drafted the legislation was the Department of the Interior's interpretation after the bill had become law, that Moss-Bennett applied only to mitigation” (1985: 330). He explains “...because of various agency opinions and, in all honesty, some changes of mind by archaeologists, the legislation took slightly different forms in the ...legislative sessions. Even now people will point out how it should have been written” (McGimsbey 1985: 328). It seems that even thirty years ago, the *Moss-Bennett* was seen as flawed or potentially flawed by one of its creators. That it remains unaltered from the 1974 version, despite McGimsbey's (1980) own criticisms of it leaves the precarious and topical position for a change to occur now, on the [lengthy] heels of the NRIS and the WCD Report<sup>49</sup>.

As a result of the Moss-Bennett, the archaeological heritage behind dams, and indeed, across the country, became synonymous with cultural heritage. Unfortunately, there is an American synonymy between archaeological heritage and

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<sup>49</sup> NRIS (National Reservoir Inundation Survey) and WCD (World Commission on Dams) Report both discussed in greater detail in Chapter 1.2.7 Literature Review.



cultural heritage, and this ideology has cost more than one indigenous people and minority group far more than isolated archaeological sites. Cultural landscapes, ritual settings and traditional means of living all blanketed under the new ideology behind 'archaeology' and archaeological protection has led to irreversible loss, both in the US and beyond her borders. In the United States, the field of CRM is dominated by archaeologists, rather than anthropologists, historians or conservationists (King 1997; Karamanski 1980; Schiffer and Gumerman 1977), leaving these latter professionals out of the dialogue, both political and academic, in regards to how cultural resource management can work more holistically.

That CRM is dominated by archaeologists and not the archaeologists' colleagues from history or the other social sciences is not a newly conceived of notion. The archaeologist forged somewhat closer bonds with government policy makers in the post WWII years, while historians and anthropologists, also earlier commissioned by the large WPA projects, returned to academia. Karamanski (1980) points out that it was archaeologists who, from those post-war years through and including the passing of the Moss-Bennett Act in 1974, lobbied the heaviest for the protection of historic and archaeological heritage. King (1997) and Schiffer and Gumerman (1977) lament that after the laws were passed and monies designated for annual research and salvaging projects (not to mention establishing an internal bureaucracy set to hire new employees), it remained the archaeologists who were offered jobs, took jobs and directed new funding initiatives, thereby "rewarding" the archaeologist for its lobbying work and "punishing" the historian and anthropologist for having not lobbied or engaged thoroughly enough in politics. Had the historian, conservationist and anthropologist been more heavily involved in the dialogues

leading up to the passage of the laws discussed in this section, as well as employed by national agencies to help govern and assess, it is very possible that the archaeological, historic and cultural landscapes in reservoirs would have been more holistically considered, and the writing of this dissertation would have been irrelevant.

The US system, despite its successes in forming an act governing reservoir flood areas and their archaeological collections (in the pre-flooding state), remains a system of “compliance and beyond” (King 1999). Compliance and beyond refers to a set of procedural standards, which require compliance or beyond compliance status (King 1999). In principal this sounds ideal. Compliance in and of itself seems of little negative connotation. However, that there is a distinction between compliance and beyond compliance is the issue. If, to the environmental engineer, compliance means to comply with the Comprehensive Environmental Response, Compensation and Liability Act (CERCLA), and this fulfills the technical legal requirement to act upon what various laws require an agency to do in order to manage its impact on the cultural environment, why should that engineer attempt to go “beyond” those actions? One goes “beyond compliance” when taking any type of positive management action. Positive management should be the reason for compliance, since the idea behind compliance is that even bare compliance result in good, thought and balanced management of cultural resources and impacts on them. As King (2004: 15) notes, “Congress did not enact section 106 ...just to cause agencies to pass papers around. Compliance ought not to be a minimalist sort of thing, and if it doesn’t result in positive management, what earthly good is it?”

In the case of the overall system of management and long term monitoring in American reservoirs, the system has been less than successful, despite the hard work of survey and excavation teams as they work in reservoir flood zones. Without their efforts a greater amount of the cultural and archaeological landscape would have long since been lost. However, the system in itself remains flawed in the long-term management of features within old and new reservoirs. Perhaps it is this system of perceived basal compliance with the Moss-Bennett Act that allows even the US Army Corps of Engineers to forego a more holistic system of longer term monitoring and public access in lieu of a certain amount of research, a limited degree of monitoring, limited specifically to those works conducted for the NRIS, and works to limit any more damage than absolutely necessary.

### **6B.3 The National Historic Preservation Act (NHPA), Section 106 and (sub-section k) implications for reservoirs**

The NHPA requires agencies to consider the effects their planned development(s) will have on historic properties, including those properties that are considered “traditional cultural properties<sup>50</sup>”. A federal undertaking is defined as “a project, activity, or program funded in whole or in part under the direct or indirect jurisdiction of a federal agency,” and includes those actions or agencies that require a federal permit, license, or approval (16 U.S.C. § 470w(7)). “Historic resource” has a specific meaning under the NHPA and is not synonymous with “cultural resource”. This distinction and some of its implications are discussed below.

Section 106 of the NHPA requires a federal agency, including an independent agency having authority to license any undertaking, to take into account the effect of

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<sup>50</sup> Properties that reflect traditional religion, beliefs, customs, and practices

the undertaking on historic resources and to provide the Advisory Council on Historic Preservation a reasonable opportunity to comment on the undertaking (16 U.S.C. § 470f). The federal agency with jurisdiction over an undertaking is responsible for compliance with Section 106. Absent statutory authority to do so, this responsibility cannot be delegated. The agency must independently make and is legally responsible for the findings and determinations required by the NHPA regulations. The Section 106 review process must be completed prior to the approval of the expenditure of any federal funds or the issuance of the license. To ensure that the review is based on meaningful consultation, the regulations require that the agency initiate the Section 106 process early in project planning when a broad range of alternatives can be considered. In the case of reservoirs, long term monitoring has not appeared on the list of broad alternatives to rescue excavation.

With respect to a situation involving an applicant for federal approval or a federal permit or license, NHPA Section 110(k) (16 U.S.C. § 470h 2(k)) prohibits “anticipatory demolition” of historic resources by applicants in order to avoid NHPA requirements. Section ‘K’ states:

“Each Federal agency shall ensure that the agency will not grant a loan, loan guarantee, permit, license, or other assistance to an applicant who, with intent to avoid the requirements of section 106 of this Act, has intentionally significantly adversely affected a historic property to which the grant would relate, or having legal power to prevent it, allowed such significant adverse effect to occur, unless the agency, after consultation with the Council, determines that circumstances justify granting such assistance despite the adverse effect created or permitted by the applicant.”

In this instance, it seems that the whole body of reservoirs and dams created by the US Army Corps of Engineers is in breach of this code, although in reality permissions would never be refused for federal reservoir projects, assuming the

archaeological heritage was minimally surveyed or excavated prior to its creation. Nevertheless, in the case of the historic and archaeological landscape, as well as in the case of archaeological resources, historic monuments, or towns left *in situ*, a case could be made that the entire reservoir flooding effort would have significant and adverse effects on these properties or landscapes. One might propose further, that although in cases where the built heritage is not damaged, but merely placed beyond reach of concerned stakeholders, there is an inherent loss since people no longer have access to that property, landscape or feature in its untouched (and above water) state.

Applying section “K” so stringently, however, would be counterproductive to the country’s need for reservoirs and the fact that thousands of reservoirs already exist, even if this illustrative application does point out, yet again, the difficulties inherent in the lack of differentiation between matters archaeological and heritage-based. This lack of differentiation poses a real problem, since a moderately well preserved building at the bottom of a reservoir does not mean that a reservoir’s construction has “no effect” on the cultural heritage of that basin. Instead, we are left with a building (or in the case of St Thomas, a set of buildings) that is moderately well preserved, unreachable by the layperson without appropriate training or gear to dive to its depth, and a broader cultural landscape, invisible from the surface and lacking all forms of traditional access.

The resulting effects of reservoir inundation on archaeological sites were never fully considered, saving the efforts of the National Park Service’s NRIS, as discussed in Chapter 1. This NPS funded study was never transformed into an attendant policy document or acted in the same way that the Moss-Bennett took into account archaeological sites and their long-term collections’ maintenance. The

NRIS was never up to the task of long term monitoring, as King, via email correspondence (February 2013), points out,

“The studies in the '80s indicated such a wide range of possible impacts and non-impacts, derived from such a wide range of independent variables, that people kind of threw up their hands and stopped pursuing the matter. No ‘best practices’ were evident then or now.”

Some best practices are considered in the analysis and conclusion sections of this dissertation, in Chapter 6: Analysis.

## **6B.4 The National Environmental Policy Act (NEPA) as the alternative**

NEPA is concerned with both cultural resource management and a natural resource management. It regulates all impacts of federal government action on all aspects of the human environment throughout the USA. “Human environment” is defined as "the natural and physical environment and the relationship of people with that environment" (40 CFR 1508.1).

It continues by laying out the specific responsibilities with which NEPA has been charged. Two of these responsibilities warrant discussion:

1. Attain the widest range of beneficial uses of the environment without degradation, risk to health or safety or other undesirable and unintended consequences;
2. Preserve important historic, cultural and natural aspect of our national heritage, and maintain, wherever possible, an environment, which supports diversity, and variety of individual choice.

Within the first of these, the phrase “undesirable and unintended consequences” is directly applicable to the consequences enacted upon archaeological and cultural heritage sites in reservoirs in the past. The use of undesirable and unintended are applicable because the effects of reservoirs have not been clearly predicted, planned for, or mitigated against, thereby relegating these effects to those which are either undesirable or unintended. If an exhaustive list of known effects and monitoring were to take place, those circumstances and this clause's applicability would change. The maintenance of preservation of the national heritage, and wherever possible, natural heritage, discussed in the latter of the two applicable responsibilities is also contrary to what has happened in reservoirs. Nothing has, in fact, been maintained regarding submerged heritage, whether in the way of prehistoric features, modern towns or unaccounted for sites, and certainly very little of the original natural heritage which may have included cultural landscapes.

The last parts of Section 102, that aspect of NEPA with which federal agencies work on a day-to-day basis (King 1997), is referred to by the commonly used acronym MFASAQHE (pronounced “Mafasakwee”), which stands for “major federal actions significantly affecting the quality of the human environment” and NEPA is commonly misunderstood as only requiring the analysis through the use of that statement (King, 2004; Canter 1996). The actual writing of Section 102 requires that agencies:

(C) Include in every recommendation or report on proposals for legislation and other major Federal actions significantly affecting the quality of the human environment, a detailed statement by the responsible official on-

- (i) The environmental impact of the proposed action;
- (ii) Any adverse environmental effects which cannot be avoided should the proposal be implemented;
- (iii) Alternatives to the proposed action;
- (iv) The relationship between local short-term uses of man's environment and the maintenance and enhancement of long-term productivity; and
- (v) Any irreversible and irretrievable commitments of resources which would be involved if the proposed action should it be implemented (40 CFR 1508.102)

It follows that the MFASAQHE is in essence an order to create an environmental impact assessment (EIA) for all works. The problem with this process is threefold. First, much like the British system of writing out laws that might be perceived as an inconvenience to specific projects, the "CatEx", or categorical exclusion exists in the American code, allowing the EIA process to be skipped entirely. The CatEx is used when heritage agencies perform tasks that are routine and logistical in nature, such as purchasing office supplies, as well as in situations when an area for development or planning is already cleared of any cultural resource issue (King 2000). This ability to write out, or categorically exclude projects from Section 102's requirements, is done on an agency to agency and the individual projects receive no further thought or planning if that agency deems it to fall outside of "significant" affects requirement.

This leads us to the second problem, and this is the issue of "significance" in legal code. The concept of significance is one of inevitable ambiguity, both in the



law and in actual practice. “Significance” does feature in the NEPA vocabulary listing, where the section describes both the context and intensity for the consideration as such (King, 2004). Regarding significance, context and intensity, the Code of Federal Regulations (40. 1508.27-28) comes to the following conclusions:

- i) Context. This means that the significance of an action must be analyzed in several contexts such as society as a whole, the affected region, the affected interests, and the locality. Significance varies with the setting of the proposed action. Both short- and long-term effects are relevant.
- ii) Intensity. This refers to the severity of the impact, including but not limited to the following, in evaluating intensity:
  - (1) Impacts that may be both beneficial and adverse.
  - (2) The degree to which the proposed action affects public health or safety.
  - (3) Unique characteristics such as proximity to historic or cultural resources, parks lands, prime farmlands.
  - (4) The degree to which the effects on the quality of the human environment are likely to be controversial.
  - (5) The degree to which the possible effects are highly uncertain.
  - (6) The degree to which the action may establish a precedent.
  - (7) Whether the action is related to other actions with individually insignificant but cumulatively significant impacts.
  - (8) The degree to which the action may adversely affect districts, sites, highways, structures, or objects listed in or eligible for listing in the

National Register of Historic Places, or may cause loss or destruction of significant scientific, cultural or historical resources.

And so even in the description of significance, intensity and context, the definition, limitations and outer extents of those words hold nothing but ambiguity. This is a recognized issue and not new to this assessment of NEPA. Butler (1987) writes that despite the many publications dedicated to fine tuning the meaning of significance in federal code, it is one that ultimately escapes defining, and that this ambiguity is not limited to federal code, but to archaeology more generally (see Dunnell 1984; Fowler 1982; Glassow 1977; King et al. 1977; King and Lyneis 1978; Raab and Klinger 1977, 1979; Schiffer and Gumerman 1977; Sharrock and Grayson 1979; Tainter and Lucas 1983). He observes that,

“Archaeologists continue to misuse and abuse the term and do not understand its meaning in terms of the cultural resource management process. In so doing, archaeologists often place federal agencies and state historic preservation offices in a quandary as to proper management decisions. Misuse of the concept of significance in the formulation of a research design may seriously jeopardize or curtail making important contributions to the discipline. In addition, the failure to understand the concept of significance may not provide the basis for rational decisions concerning data redundancy, collection strategies, predictive modeling, and mitigation.” (Butler 1987 820)

Perhaps it is this use and misuse of the term that has caused a profound lack of mitigation or monitoring measures in reservoirs. Through the careful redefining of "significance", or the overhaul of legal code to more clearly reflect meaning by avoiding the use of ambiguous language this can be avoided in the future.

The third and final problem with the MFASAQHE is that the EIA reports do not always denote full intended compliance, depending on the thoroughness of the civil servant involved in the preparation of the pre-EIA report, how literally the term “significance” is taken throughout the process, and whether the effects on all forms of cultural resources have been considered, or just the archaeological ones. In the case of reservoirs, unintended and adverse effects, while taken to some extent into consideration (see Lenihan, et al. 1980; Brandt, 2000) were, nevertheless, not initially considered in the long term, providing mechanisms or alternatives through which heritage could undergo monitoring or reassessment.

### **6B.5 Hydro Schemes**

There is no current agenda in the United States pushing for an increased number of hydroelectric dams, as observed in Britain. Whether this is due to the dramatic push for the creation of dams in the post-war years, or because hydroelectric already contributes 68% of the total renewable energy sector is not ascertainable (US Energy Information Administration 2010). What can be said is that the rate of new dam construction is extremely low compared to the rate of construction 50 years ago, probably because most of the sites best suited for damming have already been dammed (United States Geological Survey 2009). Although the possibility of new dam construction has not been omitted entirely, certainly the days of big dam construction across the nation are over. What is left is for the existent reservoirs to be reevaluated in terms of heritage content, residual cultural meaning (if original stakeholders party to that region still exist), and to what extent damages can be mitigated, and in the worst-case monitored.

## 6B.6 Gaps and Inconsistencies

Through this review of the American system of heritage management and legal code, one recognizes many of the same inconsistencies and 'gaps' in the legislation that exist within Great Britain. Laws intended to protect and provide for the future of cultural landscapes and historic and archaeological sites, provide protection within some degree of efficiency. Similar to the British system, there are limitations to protection and methods through which the EIA process can be eliminated entirely from the dialogue of development. Furthermore, there are a lack of long term monitoring of resources once are submerged. Is it possible that the US Government, even in the wake of the WCD Report and the NRIS, still considers archaeological material in reservoirs beyond hope or too expensive to conduct works on? With advances in monitoring technology, diver access and training, and the expansion of the field of underwater archaeology, this certainly cannot be the case. The US *Moss-Bennett Act* remains the sole piece of literature designated specifically for the purpose of reviewing and mitigating effects to cultural resources in the early stages of dam construction propositions, and yet it, too, falls short of the one measure that could make a difference to submerged resources- and that is the mechanism or clause that requires options for the long term monitoring of submerged resources.

This section has analyzed the American legal code and method for handling all types of cultural heritage, pointing out those areas most relevant to submerged heritage. The USA, without international obligations upon her, has proved the most likely of the two countries discussed so far, to address the issue of submerged heritage in the future, given the precedent for discussing the matter through the Moss-Bennett Act, the NRIS and the co-sponsorship of the WCD Report, although to what extent or when that could happen is pure speculation. The next, and final,

analysis centers on Egyptian policy and practice, with Egypt being renowned for one of the greatest relocations of historic monuments in recorded history.

## **6C.1 Egyptian Policy**

Two large bodies oversee the Egyptian policies that provide guidance for all matters related to archaeology: the Supreme Council on Antiquities (SCA), and the Egyptian Environmental Affairs Agency (EEAA). Egypt has remained a nation that is very economically dependent on tourist revenues, and still utilizes most of its archaeological resource base to attract the post-colonial tourist revenues of travelers from the First World (Meskell 2000). What is presented here is the fact that the archaeology in reservoirs, the submerged landscape, and those monuments which have the theoretical potential for future submergence, currently hold no special status or inherent protection—not including those antiquities described as retaining deep nationalistic value, and therefore national ownership, of all things deemed of Egyptian interest by the SCA (Tierney 2009). Due to its geography, Egypt lacks the future ability and geographical space to construct new dams on the Nile River, except the possibility of new dam formation where the Aswan High Dam fails or is upgraded. However, even if that near impossibility became a possibility tomorrow, the current legal system in Egypt still lacks the basic mechanisms to provide protection to cultural resources, even for the most basic of developments, let alone another large scale dam project. Given the lack of cohesion in the Egyptian legal system, such as the lack of EIA requirements and guidelines, and its lack of appropriate legislation dedicated to seeking a balance between development, the environment and the built heritage of the country, (EEAA, 2009).

## 6C.2 Egyptian legal code<sup>51</sup>

The Egyptian legal system divides responsibilities for cultural heritage management between two overseeing bodies: the Supreme Council of Antiquities and the Egyptian Environmental Affairs Agency. The SCA is accountable for all moveable and immovable antiquities that are inherently Egyptian or in the Egyptian national interest (Nahkla et al 2012). As such, the SCA concerns itself not solely, but predominantly with matters associated with the looting and illegal removal of antiquities in and out of Egypt, the monitoring and management of buildings or monuments listed as national heritage, and all management of excavations, collections, exhibitions and preservation of antiquities greater than 100 years old (Nahkla et al 2012; Ali 1835). That said, the responsibility for provision of some types of academic permits for excavation is dually carried out by both the SCA and the Minister of Public Instruction, depending on location and interest of mentioned parties (EEAA 2009).

The SCA was formally established in 1953, enacted by Law 529, following mandates set forth by Nasser (Grainger and Gilbert 2008). It “formulates and implements all policies concerned with antiquities; issues guidelines and permits for the excavation, restoration, conservation, documentation, and study of sites and monuments; and manages a country-wide system of antiquities museums” within the national interest (SCA 2013). This brings to attention the question of what is in the national interest. Since Nasser’s entry into government, the Egyptian national interest

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<sup>51</sup> At the moment of writing this analysis, Egypt is in a state of upheaval. The national army has overthrown President Morsi, voted into the office of the President by the majority of Egyptians, but now fallen in approval ratings to extremely low levels. A new constitution is still in the run-up to a new vote to determine its legitimacy. Therefore, whether the systems identified here will remain constant over the coming months or years is impossible to tell, but this analysis will nevertheless provide a snapshot of the government system as it is and has been from the Nasser years through the deposition of Mubarak.

has ranged from the large, tourist monuments, to historic Islamic places of worship and meaning.

Primary daily roles and responsibilities of the SCA are centered on the management of active excavations and their related publications, and promoting an awareness of the illegal antiquities trade, in so far as the repatriation of Egyptian artifacts is concerned. Figure 4.3A (chart) displays the breakdown of Egyptian SCA responsibilities and offices. While the different office responsibilities are varied, no office is tasked with managing or providing advice about development. Instead of giving voice to archaeological and other heritage spots across the country, the SCA concerns itself to a greater extent with the return of stolen Egyptian artifacts (May 2009). The most notable of these voices was the former Secretary General of the SCA, Dr. Zahi Hawass, who reached celebrity status for his nationalist range of television programs, which always came with the message that Egyptian [cultural] resources were created by Egyptians and most valuable for and understandable by Egyptians (May 2009; Spencer 2011; Parker 2009).

In addition to providing a voice for the return of antiquities, whether in the form of artifacts, statuary or pieces of monuments to Egypt, the SCA presides over domestic museums and collections with increasing criticism from foreign practitioners (Spencer 2011). That criticism derives mainly from the belief that the SCA has done a poor job –and an underfunded one- of appropriately managing and conserving collections (May 2009; Parker 2009). Dr. Hawass (2001) claimed that none of this is true and during his tenure as the Secretary General, the SCA was meant to have dramatically improved the conditions of antiquities and sites across Egypt, stating how the SCA provided the following services for the first time:

- Enforcing zoning around ancient monuments, using natural boundaries and constructing walls to delimit and protect antiquities areas
- Constructing visitors' centers with facilities and educational materials including films to introduce visitors to the sites
- Building sidewalks to guide tourists around the sites and improve access
- Developing a comprehensive conservation plan for each site
- Instituting training programs for the personnel who maintain the sites (Hawass, 2001).

The SCA is also highly criticized by with public, with criticism hinging predominantly on accusations of corrupt government officials (Anderson 2011; Waterbury 1976; Abu-Loghod 1993; Carothers 2011; Abu-Loghod 2012). Accusations of corruption continue into antiquities collections management and the whole of the archaeological management sector, headed by the SCA (Carothers 2011; Abu-Loghod 2012). Criticism and disappointment is the thread that unites the many lingering feelings of resentment and cognitive dissonance, extending back to the long years of Mubarak governance (Anderson 2011). A first hand account of these feelings of corruption are noted by a Cairo resident who recalls the “callow historic preservation efforts, which treats local Egyptians as either a problem or a threat to the tourist potential of the monuments” (Deknata 2011: 3). He continues,

“Under Mubarak, the 'Ministry of Culture' and the 'Supreme Council of Antiquities' management of cultural heritage can be read as vanity projects for state preservation... ‘The government sees people as a nuisance’, Yahia Shawkat, an architect who works in heritage planning, told me. ‘If you look at any plan done by the Supreme Council of Antiquities and some of its consultants, you're going to find the red spot on the map is the local community next to the monument or the heritage area’ (Ibid, 4).



An indiscreet and unapologetic lack of planning processes and heritage guidelines also occurs, barring on instances in which the State takes special interest, and it is this that defines the SCA's deficiency in an archaeological planning process similar to that apparent in both other case studies, the United States and the United Kingdom.

It seems, therefore, that given the lack of attention paid to Lake Nasser's cultural and archaeological heritage, and the overwhelming popular knowledge of nationalistic and corrupt interests of the SCA (Lawler, 2011), that the Egyptian society simply do not value their archaeological resources, especially not their submerged ones. Meskell (2008: 18) states,

“Amongst archaeologists it has long been said that the Egyptian people, because of the impact of Islam, hold no special relationship with antiquity and that they are largely disinterested in knowing their past, much less preserving it. However true this may seem, such generalizations make it easier for Westerners to continue their current practices in Egypt, for us to taxonomize and interpret, and to conduct our field strategies in our current quasi-colonial manner without any attempts at reflexiveness.”

Dr. Hawass, too, has commented on the overwhelming negativity of those who view his term in office as having been one of self-indulgence and corruption. He comments on it these accusations directly, in an article written in response to the *New Yorker* in 2009. Interestingly, he also comments on the general state of archaeology in Egypt, in support of his own attempts at providing a more holistic setting in which Egyptian archaeology can now take place, negating the dire need for post-colonial archaeologist interference, and in defense of himself:

“For the last 200 years, foreign teams have been undertaking all the archaeological work in Egypt. We Egyptians, on the other hand, were serving them. There were

very few Egyptian scholars who ran their own projects, and these were often minor. Today, however, Egyptian missions conduct important archaeological excavation and restoration projects that are recognized all over the world My principal goal as secretary- general is to promote both ancient and modern Egypt -- and in doing so to protect our past and to improve our future” (Hawass 2009: 19).

If we, as the foreign archaeologists support a discipline in which native archaeologists of a country are experts in their own national or cultural heritage, and if holistic attempts at interpreting and managing sites is a priority, then despite much of the controversy around Dr. Hawass, his message of holistic management not dominated by foreign workers is clear. Whether this system of management applies in any manner to archaeology still in reservoirs is never addressed. Perhaps, since Egypt is newer to autonomy and the self-determination of cultural heritage principles, she simply has not “caught up” with other “more comprehensive” nations’ policies.

Other agencies and laws exist within Egypt that may be more useful in determining to what extent a reservoir policy might exist, or at least allow one to pin down where such guidelines might prove useful to current legislation. Unfortunately, the current disjointed development and antiquities laws do not touch upon the issue of cultural heritage in planning or development in any systematic way, least of all in relation to best practice guidelines related to dams and reservoirs. Law 106 of 1976, and amending Law 101 of 1996, is related to the organization of the erection (or demolition) of buildings, monuments or other industrial developments (APL 1996). This law does not touch on cultural heritage. Articles 4 and 24 of the Law on the Protection of Antiquities are focused solely on the protection of antiquities in the

event of accidental or fortuitous discovery, and require notification within 48 hours of such finds, movable or immovable, to the appropriate authorities (APL, 1983). Those articles, rather than serve as enforcement and best practice during the routine course of development and planning, serve instead to act like the British equivalent “Treasure Trove”, although with fewer rewards going to the finder (Meskell 2008). In practice, even when articles 4 and 24 are enforced or practiced with good intention, the remaining appended articles assure the licensing of excavation to the appropriate domestic or foreign archaeological excavation and salvage teams (Meskell 2008). There is neither mention of reservoirs nor development based finds. Nor are strategies for mitigating damages or systematic methods for creating a heritage-based impact assessment evident.

Articles 16 and 22, of the Antiquities Protection Law pertain to the compensation, handling and development of structures adjacent to or on Antiquities (APL 1983). As such, these articles, aimed at real estate development and needs, could be expounded upon in order to regulate matters pertaining to dams. Article 22 most pertinently states the following:

“The competent organ must include in the license provisions which the Council sees guaranteeing the establishment ...is in a proper way that *does not predominate over the antiquity or spoil its appearance* and ensure for such a suitable sanctum together with taking appropriate of the archaeological and historical environment and specifications guaranteeing protection of stated antiquity” (APL 1983).

Although this specific amendment came into force thirty years after the initial phases of the construction of the Aswan Dam, one might infer that the article could be based to some extent on the presumed success of the relocation of monuments and

the attempts at refashioning the cultural landscapes abutting to Lake Nasser. As such, Lake Nasser comes to the fore as an excellent demonstration of the potential behind this article and its efficacy in attempting to seamlessly mesh progressive development with not only one antiquity, but a host of antiquities, archaeological monuments and the historic, cultural environment. Amendment of Article 22 therefore seems expedient and timely, should Egypt determine to construct future reservoirs. In future instances, however, greater attentions could be paid to those sites of cultural and archaeological interest that, despite fulfilling the requirement of being in the national interest, also fill the requirement of being at risk of deterioration in a large scale submergence event.

### **6C.3 The EEAA**

Within these laws, there is space for expansion for inclusion of reservoir and dam construction regulations, and while there are specific instances appropriate for that expansion, the EEAA may prove an even better agency to handle the progressive developments associated with dam construction. Much like its British and American counterparts, Egypt tried to successfully merge aspects of heritage management with the entire environmental impact assessment process, but unfortunately Egypt falls short of comprehensive policy (EEAA 2009; Salheen and El Khateeb 2009). The lack of planning and EIA consideration does not stop at archaeological and cultural resources, but the entire process of the EIA is lacking, and virtually nonexistent. There is hope, however. The environmentally and socially based monitoring systems, initially used as a one-time measure on a massive scale during the construction of the Aswan High Dam, are returning to the epicenter of working paper focus. of a set of guidelines compiled by the EEAA, for introduction into a coastal

zone management along the northern coast of Egypt in the vicinity of Alexandria (EEAA 2009). These monitoring systems are due for implementation not only along the Mediterranean coastline, but also along Lake Mariout, a brackish lake on the inland side of the city of Alexandria (EEAA 2009). The SCA, which regulates all archaeological materials, including those located in or along inland waterways, has not commented on the Lake Mariout guidelines (EEAA 2009). However, these guidelines represent a potential turning point for the future of Egyptian environmental monitoring and reporting (Salheen and El Khateeb 2009; Fischer 2002). There is no clear future, but other calls to provide the country with a streamlined system that combines environmental and social impacts (including heritage based ones) include the 2009 working paper, "Integrating Environmental Assessment in the Planning Process" (Salheen and El Khateeb 2009). In this paper the authors suggest that "Strategic Environmental Assessment" (SEA), defined as a systematic process in which environmental, economic and social consequences of proposed policies, plans and programs are evaluated at the earliest appropriate stage of decision-making (Lee and Walsh 1992; Wood and Djeddour 1992; Therivel et al 1992; Buckley 1994; Sadler and Verheem 1996; Partidario 1996; Partidario and Clark 2000; Fischer 2002), is viable as an approach to achieve sustainable development in Egypt. The defining factor is that it undertakes to integrate environmental considerations into decision-making processes in relation with governmental policies at early stages (Salheen and El Khateeb 2009).

SEA represents hope for the future of a streamlined system of managing tangible cultural resources alongside better, more holistic EIAs and the country's need for development of all sorts. Since the SCA offers little bureaucratic flexibility

and having remained dedicated to its own, somewhat limited sets of causes within a nationalist agenda, the application or introduction of the EIA and EEAA signify cultural resources' best future hope for consideration, even if the prospect of future dam construction along the Nile in Egypt is limited. This does not excuse the legal system of Egypt from any guilt at not better monitoring or enforcing a more comprehensive set of planning and developing guidelines, but to some extent those guidelines are almost a moot point. Egypt, being an arid country, has in her borders only one large body of freshwater running through her that can be dammed with the purpose of energy generation and freshwater provision. The Aswan High and Old Dams represent two already existing examples of the mass restriction of water flow through the Nile River, and the country is running out of Nile River to dam (Cunningham 2012; Kendi 2013; Pottinger 2013; Dyer 2013; UNLS 1985). There is simply no space or plans in place to construct another dam further upstream on the Nile, since Lake Nasser already spills over the border into the Sudan. However, the potential for greater dam at Aswan that would be capable of holding a greater basin of water is certainly possible, and the creation of such a dam would mean the flooding of thousands of monuments along the Lake Nasser shore- including the monuments relocated as a part of the "International Campaign to Rescue the Monuments of Nubia".

As for the spillage of Lake Nasser into Sudan, Egypt still finds itself in negotiations with the Sudan and Ethiopia over water rights and those impacts on Egypt's Nile water supply (Ministry of Irrigation 1955; Khendi 2013). Whether Egypt will reign victorious over that debate is yet to be settled, given the current unrest of the national government and the relatively recent inauguration of the

Merowe Dam in the Sudan- a construction project with a degree of support by Egypt (Sheikhelden 2007), because it would capture silts and prevent them building up in Egyptian dam heads. However, since the Nile Waters Treaty<sup>52</sup> grants 82% of water allotment rights to Egypt,<sup>53</sup> that strategic friendliness may not last depending on the face of the future government and how upstream countries manage their outlet water supplies (Aswain 2013). This scenario could blossom into an Egyptian decision to raise the Aswan even higher, thereby greater a larger water basin for its own irrigation, drinking and hydroelectric uses. Such a prospect could also be seen as an attempt at stabilizing the country, and thus creating an opportunity to raise national revenues from the influx of professionals, including archaeologists, and tourists keen to see progress and monuments, should those new floodplain wash over any of the existing monuments or archaeological sites of Egypt.

#### **6C.4 International obligations**

Egypt is a signatory of all of the UNESCO Conventions concerning cultural heritage, having joined UNESCO as full state party to it in 1946 (UNESCO 2013a). Throughout its sixty-year membership, Egypt received the approval of assistance 46 times, with assistance purposes ranging from training advice and support, to funding requests (UNESCO 2013a). As a signatory and member, Egypt is obligated to protect its natural and cultural heritage (UNESCO 2013a). Despite the current political unrest of the country, and the damages done by looters to sites and museums across the country as a part of the 2011 protests against Mubarak, Egypt continues to engage with UNESCO through the undertaking of the new “Urban Regeneration for Historic Cairo” project, which operates in cooperation with UNESCO, and seeking

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<sup>52</sup> Negotiated by the British in 1959

<sup>53</sup> Leaving the nation of Sudan with the remaining 18%.

further advice, training and funding through the UNESCO “Rapid Regeneration Grants Scheme” (UNESCO 2013a). Egypt’s continued participation in UNESCO programmes suggests that if UNESCO were to pass a convention or amendment to a convention, concerning submerged heritage in reservoirs, it would likely sign and obligate itself to the new set of requirements, priorities or other monitoring works discussed in that body of text.

## 6C.5 Conclusions

While Egypt remains unlikely to build a new dam in the foreseeable future, there certainly exists within its branches of government and legislation the space and ability to address the needs of submerged heritage. Since there are currently archaeological and cultural materials within Lake Nasser (see Chapter 5b.1), the creation of articles amended through expansion or the creation of entirely new articles seems timely and warranted. However, the likelihood of these sets of actions is tenuous. Given the current instability of the country, the continued lootings of Egyptian museums and the sharp drop in tourist revenues over the last two years, the Egyptian Government and all of its branches –SCA and EEAA alike- will inevitably continue to be faced by challenges far more wide ranging and of greater importance to the well being of the country than this issue of heritage in reservoirs. It is the author’s opinion that the creation of amended and streamlined systems of government in Egypt could present useful to the Egypt society through the stabilizing of the works of the government, and might provide a more solid foundation upon which the new Egypt will be based; thereby transforming Egypt, through the small changes to heritage and environmental policy. These small changes and additions to legal systems do add up, and when small changes have a large effect, like the



systemization and amalgamation of heritage and EIA processes more effectively, confidence in a society and confidence of that society in the breakdown of bribery and corruption will prevail. Therefore, these small changes could go so far as to boost confidence and support ethical and sustainable development in Egypt, regardless of what the new face of Egyptian Government looks like in the coming months and years. As Meskell points out,

“Many archaeologists have seen other sides to this argument... But we have to recognize our place as interlopers in a foreign country and that our life experiences are contrary to those invoked in the petition. We again must question why dead Egyptians are more important than living ones” (Meskell 2008: 19).

It is toward this goal of providing for the living and future generations that all of the policy changes suggested herein exist, for without looking to future generations and the welfare of them, archaeology loses its purpose. Egypt was the first recorded location of a large-scale archaeological reconnaissance and rescue effort at the national level, and so the world will undoubtedly continue to look to her forthcoming policies regarding submerged resources and the long-term management of cultural resources, as she continues to struggle toward the stability that the people of Egypt are fighting to claim.

### **6D.1 Internationally applicable Conventions and Works concerning the conservation of Submerged Resources**

Although UNESCO plays host to the United Nations Convention on the Protection of Underwater Cultural Heritage and the United Nations Convention on the Protection of World Cultural and Natural Heritage, there are no articles or conventions specifically written to address the unique protections that could be

associated with heritage submerged in reservoirs. However, Article 1 of the Convention on the Protection of World Cultural and Natural Heritage defines ‘cultural heritage’ as

“architectural works, works of monumental sculpture and painting, elements or structures of an archaeological nature, inscriptions, cave dwellings and combinations of features, which are of outstanding universal value from the point of view of history, art or science; groups of separate or connected buildings which, because of their architecture, their homogeneity or their place in the landscape, are of outstanding universal value from the point of view of history, art or science ; works of man or the combined works of nature and of man, and areas including archaeological sites which are of outstanding universal value from the historical, aesthetic, ethnological or anthropological points of view” (UNESCO 1972).

This definition is directly relevant to the case for submerged resources, as it also contains a problem: discerning which monuments, buildings, sites or landscapes are of an ‘outstanding’ value, since no intrinsic meaning or interpretation of ‘outstanding’ is currently recognized. It is this ambiguity that has caused the application for sites from varying countries for consideration as “World Heritage Sites” to be rejected or put on waiting lists pending further consideration (Waters 2000; UNESCO 2013).

However, reactions of the international community to the threat that the world's common heritage would be lost under the waters of these large dams shows that the protection of cultural heritage is not just a national issue but rather a world issue. That is why Egypt's Aswan High Dam triggered an international archaeological salvage operation of the ancient city of Nubia as early as 1950s. That is why more than 300 archaeologists from many nations worked side by side with

their Turkish counterparts during the excavations of the ancient city of Zeugma. Moreover, the evidence that many NGOs, both in Turkey and abroad, started campaigns against the Ilisu Dam show that people, or at least focused interest groups, across all continents care about cultural objects (Komurcu 2002: 235).

Nevertheless, saving the scope of the World Commission on Dams Report (2000), this lack of monitoring and the actual effects of reservoirs on submerged resources is not apparent at the international level, following the legal sentiment of *entia non sunt multiplicanda praeter necessitatem*<sup>54</sup> (Udombana 2004; Romano 1999; Quiricio 2009). Udombana (2004: 811) notes, “In recent years, the international community has witnessed an avalanche of international dispute settlement mechanisms... It is the consequence of a tumultuous amplification of the number and ambit of institutions consecrated to ensure compliance with international legal obligations and settlement of disputes arising therefrom”. One must therefore consider the possibility that the international bodies simply cannot continue to expand in order to account for any myriad of issues that might arise and which is not considered serious in nature and not considered by the international community to be a breach or concerning fundamental human rights. A deeper discussion of possible causes for the lack of monitoring or basic addressing of the problems surrounding heritage in reservoirs at the international level are addressed in greater detail in Chapter 6 (Analysis) of this dissertation.

## 6D.2 Internationally-shared Responsibilities

To imagine that the lack of monitoring in reservoirs is an issue that only dominates western culture or academic agendas is a fallacy. The problems

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<sup>54</sup> Latin, meaning “Entities must not be multiplied beyond necessity” credited to William of Ockham (1258-1347) and also known as Ockham’s Razor (Thorburn 1918).

associated with the monitoring of heritage in reservoirs and providing real mitigating measures for those sites is pervasive and across all systems. It is relevant in Turkey, China, Portugal, Brazil, and any country in which reservoirs provide sources of drinking water and electricity. These problems have been encountered on more than one occasion, the countries and policies discussed in this dissertation provide only a cross-section of examples that do not give justice to the discussion of reservoir construction in Nepal, India, Lesotho and almost any other country with a river running through it. The relevance of this discussion in reference to any country that continues to create reservoirs is timely and perhaps capable of stoppering the worst of effects in these countries, as they have not yet fully utilized their waterways to the fullest of hydroelectric or damming potential. Countries with years of experience both in policy and practice of managing reservoirs and submerged resources, such as Britain, the USA and Egypt must provide the impetus to change the way reservoirs are conceived of and managed, and bear responsibility and acknowledgment of their roles in dam construction abroad, while sharing the knowledge gained from internal experience with countries still

building

dams.

The Ilisu Dam in Turkey, the Three Gorges Dam in China, the São Luiz do Tapajós Dam in Brazil, and the two dams planned for the Sabor River, known as the Baixo Sabor Scheme (BSS), in Portugal have all received criticism for their locations, lack of environmental and heritage concerns and the lack of consideration of local or indigenous people's rights who live along the river banks involved (International Rivers 2007; Global Heritage Fund 2010; Strang 2010; Aydinoglugil 2012; Dissard 2011; Rocha 2012). These situations, in which indigenous

populations are involved, add complexity to an already complicated circle of policy, archaeology and heritage management. The complexity is such because different countries word their own policies and laws differently. For instance, in Portugal that which defines a site or good as cultural heritage is somewhat fluid given cultural heritage's inherent link with that which is of 'national interest'<sup>55</sup>. Items or sites may be omitted if not classified as a particular interest level (Heritage Law 2001).

While issues concerning indigenous people's rights have remained of lesser concern in Egypt and the UK due to the differences both in culture and law, as well as different population demographics, indigenous and local people's rights continue to play a pivotal role in cultural heritage management in the USA. These policies should be of interest and discussion in Brazil, China, Portugal and parts of Turkey, where indigenous voices have gone virtually unheard, and where a critical assessment of American NAPGRA goals have succeeded and failed. Ignoring indigenous people's rights, as well as the rights of local populations, does constitute a breach of the UN Convention on Human Rights.

Submerged archaeological heritage is a protected asset under the UNESCO conventions as well as the UN Convention on Human Rights. The author does not argue that submerged archaeological resources hold the same weight, necessarily, with the right to freedom of life, religion, and pursuit of happiness. However, to indigenous groups and local populations, the cultural resources that have been and continue to be submerged are integral to identity and sometimes religion. Through the construction of dams and reservoirs, governments willfully choose to remove access to those cultural resources, and this is where the breach occurs; here at this

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<sup>55</sup> That Portugal defines cultural heritage, as being in the national interest is not unique to Portugal, but serves rather as one example.

moment of decision to restrict access. The author argues that restriction is what causes the breach, and also the problems encountered and controversies surrounding big dams. If types of access are changed, with local members of the public or population capable of accessing those resources, whether as stewards (thereby placing local populations in control of locally important cultural resources, rather than the outsider-archaeologist or heritage manager) or trained divers, it is possible to change local populations' understandings of the dam. Change comes through empowerment and stewardship, rather than last-minute planning and poor stakeholder negotiations.

Governments choose to build dams for many varieties of reasons—to create reservoirs for drinking water, to increase availability of electricity, and sometimes to generate state-revenues—but to sacrifice the needs of the minority for the majority in such a way is still a breach of human rights. Heritage conservation policy has already been acknowledged a tenet of human rights, so there is every reason that submerged resources should hold the same status. This is not to say that reservoirs are inherently damaging, that they should under no circumstances be built, or that other aspects of the human rights compendium should not be prioritized, but the pattern around the world is to build dams and fill reservoirs, and negotiate with local peoples after the initial decision to build the dam has already been made. The truth is that reservoirs are important, and will continue to serve a useful purpose as the human need for power and fresh water increases, along with a burgeoning world population. To build reservoirs and not breach human rights is possible, but it requires careful planning, long-term monitoring efforts, learning from the mistakes and successes of other nations and their policies, and a thoughtful reconsideration of the relationship between governments, cultural resources and the question of

stewardship.

Even in cases when local and indigenous populations are consulted and there are relatively few inter-stakeholder issues, there remains the likelihood that archeological resources will undergo many types of changes: chemical, biological, and spatial. However one aspect of submerged resources must change within archaeological ideology. Gruber (2008: 278) writes, in reference to the Three Gorges Dam, “Even if much heritage can be saved, many invaluable objects will be lost. Any heritage sites and objects that have not been detected before the water level reaches them will never be found.” This, once again, exemplifies the problematic state of heritage law and the attitudes of those practitioners of archaeology and cultural heritage management: If objects or sites are not found before the water level reaches them, they will never be found. Surely, heritage managers must recognize that many different considerations must be taken into account regarding dam, and other development projects, and it follows that those considerations should reflect not only in cultural trends and urban life, but also in the policies set in place to protect and manage archaeological resources. If cultural heritage sites are a non-renewable resource, it is a necessity to integrate them into the process of change, and not let them stand in competition to it. Instead, a balance of understanding what can be preserved in the short and long term, as well as setting into motion the political means through which maintenance and monitoring can take place, are essential to the future of cultural heritage sites.

In Brazil, this case is also germane. Of the Brazilian system, Calderalli, Neves and Costa (2009: 18) discuss that despite the 1961 Heritage Conservation Law, “most of the time, sites are intentionally destroyed. Some are even recognized as

such prior to destruction.” Hence, the existence of an archaeological heritage protection law in Brazil has not yet prevented damage and hundreds of sites are disturbed every year, either due to individual action or to large-scale enterprises. It may come as no surprise therefore, that even in the current government order in Brazil, archaeologists, unacknowledged local inhabitants and indigenous peoples feel frustrated with the heritage system, especially considering the large dam-building projects focused in the Amazonian River basins (Funari & Robrahn-Gonzales, 2007; Pourier, 2013). This is particularly relevant because although rescue archaeology is permitted to occur<sup>56</sup> even in the event of dam construction in sensitive areas, the option of relocating features toward eco- or archaeo-tourism simply does not exist (Ries, 2003). In this case, Brazil and Amazonian archaeologists would be best to consider longer-term management scenarios.

In Turkey, there is an option to relocate features for the purposes of archaeo-tourism, but the system remains in a state of potential improvement. Shoup (2006: 246) points out that there is an “apparent contradiction between planned flooding and continuing tourism”, since archaeological sites “...when used as entertainment are relocated,” meaning that “this act compromises their main purpose”. The South-Eastern Anatolia Project (GAP) has plans to include “the identification of all cultural properties including architectural structures and small finds... and the transfer of moveable properties at Hasankeyf” (GAP 2005). However, the 2000 International Development Committee's (IDC) fact-finding mission showed that “the accelerated time frame for excavation in the Ilisu area was 'unrealistic and contrived' and the Mission concluded that the constraints of time and money imposed by the dam

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<sup>56</sup> Contract archaeology often funds more in depth archaeological research (Rocha, 2012).



construction schedule made a mockery of any claim that a full and competent investigation of the archaeological wealth of the site is being made" (Hildyard *et al.* 2000: Box 12; Shoup, 2006). These critics imply that because Turkey avoids the EIA process and does not allow sufficient time and resources for salvage, it therefore violates international law, although the author points out that critics, developers, or those involved in the IDC fact-finding mission failed to consider the more rounded and long-sighted option of including mitigation and monitoring measures for the future.

The same holds true in China as well, throughout the processes leading up to the creation of the Three Gorges Dam. Over 1,300 sites of archaeological value were discovered in the Three Gorges area, including sites from the Paleolithic Period, graves from the Warring States Period (475–221 BC), and farmland sites from the Tang (618–907 AD) and Song (960–1279 AD) Dynasties (Xi 2009). To save as many heritage sites and items as possible from the floods, a very large program, called the “Three Gorges Relics Rescue Program”, was initiated for their relocation, involving about 100 archaeological teams (Ponseti & Lopez-Pujol 2006: 174). No actions were taken to preserve areas *in situ* prior to inundation. No plans to monitor in the longer term were put into place by the Chinese government.

Archaeologists and policy practitioners must recognise that submerged resources may not constitute lost resources, but are nevertheless resources that should have proper mitigation and conservation plans in place, in addition to systems of monitoring.

### 6D.3 Conclusion

The analysis of policy across the range of countries discussed in this chapter

has focused solely on the policies most relevant to submerged resources and their application to this type of resource. The issues surrounding heritage that becomes submerged in a reservoir are cultural, political, social and at times intentional and purely nationalistic. What this chapter sought to emphasize is that there is no need to consider dams and reservoirs as the inherent enemy of all forms of tangible cultural heritage, even if their long-term but temporary submergence causes our generation to lose sight of them. There is space in current legislation to address this issue without the need for long and extremely complex changes to the existing framework.

The policies in place in the USA, Britain and Egypt all make attempts at addressing submerged resources, but each set, in its own way, falls short of comprehensive and long-term management of submerged resources. The frameworks exist for this management and monitoring, although whether a change in the definition of 'submerged landscape' is needed, or will address the situation remains unclear. So, too, is the question of international convention applicability and whether new conventions would be required to affect a change. The author suggests that new international conventions are not needed, unless the current status of submerged landscapes undergoes a new period revised understanding and defining. The current international framework holds ample flexibility to allow submerged resources to take a recognized place. Domestic legislation that is more comprehensive and longer sighted is the key to monitoring, thereby mitigating risks to archaeological features in the water.

Political change will come when consideration of potential stewards for these newly submerged resources becomes an important facet of the dialogue, and archaeologists and heritage managers insist on that change. Political change will

come when early planning is deemed essential to reaping the full rewards of dam, reservoir and base of archaeological resources, but to those archaeological resources, the reservoir does not represent a quantifiable 'end', but a transformation from one type of site to another, and one which undoubtedly undergo another period of academic upheaval when the reservoirs is at the end of its long life and these 'new' underwater sites are on the verge of terrestrial reformation. This potential resilience and transformation of sites will eventually require redefining the meaning of submerged landscape, and taking this term and applying it more broadly from its tentative position of salt water, to all bodies of water, regardless of how they were formed.

Seemingly laissez faire aspects of heritage conservation policy must keep pace with the changes that developers, archaeologists, and members of the community create and demand. If features in a flood valley are known to undergo this transformation and archaeologists, the so-called 'stewards' of the past, do not take action, then it is only through political will and activism that the past will continue to be cared for and conserved to the fullest extent possible, whether in foreign museums, or *in situ*, where at least local people might one day again have access to their now-submerged past. Chapter 10 contains the policy recommendations that derive from this chapter's policy analysis, taking into account the first-hand conclusions from the three case studies presented in this dissertation.

*Life in a garden is relaxed, quiet and sweet  
...but survival in a howling desert demands action,  
the unceasing manipulation and mastery of the forces of nature.*

-Leo Marx, *The Machine in the Garden*

## **CHAPTER 7: CASE STUDIES**

### **7A.1 Underwater Fieldwork, Scotland (Six Reservoirs: Fruid, Talla, Daer, Megget, Camps, and Upper Glendevon)**

In the spring of 2012, ten weeks of original fieldwork were undertaken in order to survey features previously surveyed or excavated by either the Biggar Archaeology Group (BAG) or noted in detail by earlier archaeological survey as recorded through the *Royal Commission on the Ancient and Historic Monuments of Scotland* (RCAHMS). Specific features in six different reservoirs were located, surveyed (non-intrusively) and recorded in order to provide a data set for use in either proving or disproving the thesis that archaeological sites in reservoirs are not inherently damaged or lost, and to help provide an understanding of the effectiveness of policy in regulating or mitigating those effects. Although the likelihood of archaeological remains in many of the >1000 reservoirs (Scottish Parliament, 2010) scattered across Scotland was very high, in order for new survey information to convey meaning in this context, only reservoirs that received some degree of scrutiny by archaeologists either post or mid-inundation were adequate candidates for

research. Only through these means could cross-analysis of related feature data occur.

Ultimately, a final selection of six reservoirs was made: the Upper Glendevon Reservoir in Perth & Kinross (figure 29); the Daer and Fruid Reservoirs in South Lanarkshire; and the Megget, Camps and Talla Reservoirs in the Scottish Borders (figure 40). The reservoirs in South Lanarkshire and the Borders were chosen due to the works completed by BAG from 1999–2003, which included detailed plans, images and commentary. Consideration was given to several reservoirs in central and northern Scotland, but regional dive restrictions in certain reservoirs, and a profound lack of archaeological data were compelling enough to limit the final choice of reservoir to the Upper Glendevon. The Upper Glendevon Reservoir was surveyed in 2003 through the combined efforts of the Perth & Kinross Heritage Trust (PKHT) and the RCAHMS. The 2003 surveys produced plans, photographic evidence and a Geographic Information System (GIS) map of the Glendevon Valley and its associated archaeological features. The list of individual sites chosen for survey is long: over 36 unique features were selected for attempted relocation, and then surveyed, drawn and photographed.

Archaeological survey in Scottish reservoirs has been a hereto-limited endeavor; most inland water surveys and excavation have focused predominantly on lochs (and sea lochs) in efforts to better understand crannogs and their role in Scottish culture and history. In the case of the five reservoirs nested in the Scottish Borders and South Lanarkshire area, known geologically as the Southern Uplands of Scotland, only the Megget Reservoir was the site of any archaeological investigation pre-reservoir. The creation of the Megget in 1983 served as the first reservoir-survey

site in Scotland, with most attention focused on the location of the Cramalt Towers in the Megget valley (Ward, 2013). The Talle, Fruid, Camps, Daer and Upper Glendevon were not surveyed prior to their creation, as archeological survey simply was not required at the time. The knowledge of what archaeological sites lie within them is therefore limited to points of interest noted in Ordnance Surveys and those archaeological sites that have been revealed through the yearly fluctuation of water, which is sometimes low enough to surrender those sites within the reservoir's draw down zones to the eye of the local archaeologists and public.

## **7A.2 Geology and Geography of the Scottish Borders, South Lanarkshire, and the Central Belt**

The Southern Uplands in Scotland forms one of three distinct areas of geographic regions on the mainland, with the other two known as the Highland and the Central Lowlands. The region lies south of the Southern Uplands Fault line, which runs laterally from Ballantrae to Dunbar, and is comprised of a number of ranges of hills (; relevant to this thesis are the Lowther Hills and Moffat Hills. The Daer Water is nestled in the Lowther Hills, dammed at its headwaters to form the Daer Reservoir, and is a tributary of the River Clyde. The Reservoirs Talla, Camps, Fruid and Megget are located within the Moffat Hills.

Geologically, the region is composed primarily of Silurian deposits, dating from circa 400-500 million years ago (Charlesworth 1927). The Silurian deposits allowed for the formation of great tracts of peat and coal, for which the region is still relatively noteworthy. *Geology Scotland* (2012) points out,

“The area is notable for its glacial deposits, particularly drumlins, and for its coastal landforms, particularly salt marshes,

sand flats and mudflats. The landscape of this area reflects the underlying geology, with the whole area having been modified by the effects of glacial erosion and deposition during the Ice Age. Glacial erosion shaped the main valleys and molded the western uplands, which are extensively ice-scoured. The valleys have been deepened and the hills molded by the passage of the ice. Particularly striking examples of glacial streamlining are represented along the margins of the Tweed valley. The lower ground is mostly covered by drift deposits, comprising till, sand and gravel, from the last ice sheet. These deposits include outwash terraces and drumlins. Meltwater channels are common along many of the lower hillslopes, particularly bordering the northern flanks of the Moffat Hills. Many of the valleys on the south side of the uplands and the area around Stranraer contain large spreads of glacio-fluvial deposits.”

It was imperative to this case study to provide both variable and constant factors in determining the extent of preservation or deterioration of archaeological features. The Daer, Talla, Camps, Fruid and Megget Reservoirs, all located within 50 miles of each other within the Southern Uplands and contain similar substrates, while the Upper Glendevon deviates from the other reservoirs’ norms. Other variations in reservoir data included length of reservoir life (i.e. when the reservoir became full and functioning) and the types of archaeological site investigated. By varying the types of sites investigated, a broader spectrum of data could be produced, providing a more holistic overview of reservoir conditions and effects. Approximately 80% of the archaeological sites investigated were in different areas of draw-down zones of the reservoirs, which provide a focal area for discussion and comparison. The 20% of features below the draw-down zone are included in this discussion because of the potentially divergent data drawn from features of these two different zones (i.e. they will form another basis for comparison). Damage assessments and comparative analysis took place within days of on-site evaluation,

with further analysis and graphing of results occurring several weeks after completion of all of the fieldwork. The individual damage assessment forms are appended to this dissertation, although details of their results and the concomitant graphs are discussed both in individual feature discussions and in the analysis.

The five reservoirs in the Southern Uplands displayed positive preservation characteristics in the lower two-thirds of the reservoir floor, although the upper third proved less than ideal<sup>57</sup>. More than 30% of the reservoir floor and substrates consists of light sediments (Scottish Heritage 2011); these silts impact on gas exchange and can lead to the creation of an anaerobic environment: optimal conditions for good preservation of archaeological features and related artifacts. Clay, sands and bedrock were present, with approximately 20% of the floor composed of pebbles, gravel, cobble and boulders combined. In the upper third of the reservoir floor (the shallowest areas), a high presence of inorganic stony substrates, ranging from gravel to boulder (2 to >256mm diametre) were sampled, and amongst these samples less than 10% of the area was covered by silt (Scottish Heritage 2011). This is evidence of regular erosion and sediment displacement in the upper one-third of the reservoir: the entirety of which also closely matches the area of these reservoirs known as the draw-down zone. Additionally, regular samples in the shallow areas of the reservoirs showed high levels of macrophyte growth, which would over-oxygenate the water both during the growing season and in times of macrophyte decay (Scottish Heritage 2011), which could further deteriorate organic archaeological deposits such as wood.

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<sup>57</sup> See Appendix "EXCEL" on multimedia disc for a list of feature recording sheets and associated scores



### 7A.3 Daer Dam & Reservoir

There was little controversy surrounding the erection of the Daer Dam and the Daer Reservoir at the time of its inauguration by Her Majesty the Queen in 1956 (Ward 2010). The reservoir was created to provide additional drinking water to South Lanarkshire area populations, after a rise in numbers directly following the WWII years. In the years since its inauguration, it has seen a yearly fluctuation in water levels of between four and eight metres, depending on the seasonal variations and demands on water resources by the predominantly agricultural surrounds. It remains a source of drinking and irrigation water to the Borders and South Lanarkshire areas, despite the periods fluctuations; which see the water level at its highest in the mid-late spring and at its lowest in the autumn and early winter. The compound remains under the control of Scottish Water, which is responsible for monitoring the hydrology of the whole of Scotland's reservoir systems. The dam adjoins the regional Scottish Water engineering compound and maintenance offices. The Daer Reservoir is nestled into the Daer Valley, part of the Lowther hills, which surrounds the body of water; the hills making the reservoir and dam nearly invisible to viewers unless one happens along the farm tracks directly adjacent to the Scottish Water access roads.

The Daer Reservoir (referred to hereafter as “the Daer”) has a maximum depth of 31.1 metres at maximum fill capacity. Yearly temperature fluctuations vary from 1°C-14°C. When the water is at its lowest capacity it creates a maximum depth of 23m, and at this point, the water's edge retreats some 20 metres from the high water mark foreshore, revealing a number of archaeological sites. The Daer and the surrounding valley has been a focal point for BAG's investigations over the past

twenty years. Of key interest to BAG, has been this area of revealed draw-down zone, in which local archaeologists quickly work to record and excavate the features that are considered most 'at risk' of erosion. BAG, during these short 1-3 month windows of survey and excavation opportunity, must work quickly since the water levels begin to refill in the autumn, and even as they work, trenches can flood with water from the saturated water table. It is through these expedient works of BAG that the follow up surveys at the Daer (and other reservoirs in South Lanarkshire & the Scottish Borders) could take place.

#### **7A.4 Archaeological Investigations: Biggar Archaeology Group and Case Study Fieldwork (CSF)**

A variety of archaeological sites were investigated by BAG in the Daer Valley and in the draw-down zone of the Daer (figure 41 shows those geolocated through the RCAHMS). During the seasons from 2003-2006, BAG uncovered over two dozen unique features in the draw-down zone (BAG, 2010). Works undertaken by this thesis' CSF did not include all of the features investigated by BAG, either in the Daer or elsewhere, but a sampling of them were decided upon with the assistance of BAG's director, Tam Ward. Ward was called upon to help in the decision making process, as his experiences in the Daer were second to none, and his expertise in the Daer Valley would provided insight into what the local community considered the most 'at risk' features, as well as the most interesting. Following numerous in-person discussions and e-communications, a short list of appropriate features were drawn up. It included the Kirkhope Tower (not to be confused with another local Kirkhope Tower, located on a hilltop not far from the Daer), a large mound, two cairns and investigative survey of an area of land below the low water mark. This

swatch of land seemed to present an abundance of archaeological features, but because of its location in the water, made survey to the members of BAG impossible. Instead, teams of CSF divers would investigate and report findings both in this thesis and to BAG. The results of those investigative dives did not provide useful comparative analysis of features, indicating instead that underwater survey of archaeological features in reservoirs is possible and easy enough to execute toward productive ends: mid-term monitoring must not be dismissed in lieu of rushed pre-inundation survey or excavation efforts. This is particularly true in the case of those archaeological or historic features that will rest below the draw-down zone line.

## 7A.5 Daer Reservoir

### Kirkhope Tower (DA01)

The Kirkhope Tower, now understood to be a bastle<sup>58</sup>, stands along the western bank of the Daer, 20 metres east of the high water mark. When the water is at its highest, the foundations sit at a depth of approximately 7 metres, allowing for safe diving and easy access. Its OS reference is NS 9675 0651, and the first mention of the structural remains appears in the 1859 Name Book. Original documentation about the tower is limited to its approximate size, at approximately 20 square feet (Canmore, 2012). In his online RCAHMS notes, Ward (1995) provides an abbreviated account of the tower's mid-inundation period (at low water) survey:

“The remains of Kirkhope Tower were partially excavated to determine the architectural details and ground floor plan. The building has lime-mortared random rubble walls measuring 1.2m thick, vault springing at 1.7m above the gravel floor, byre drain in basement 0.8m wide, roll moulded window and

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<sup>58</sup> Due to the investigative works undertaken by BAG in 1995.

door frames, projecting stair turret on N wall. Dumfriesshire sandstone was used to construct the doorways and stair newel. The finds indicated abandonment by the 18th century.”

A general plan of the foundation was created by BAG (figure 48), with special focus on the stair turret, as provided in figure 46. The entire foundation of the tower was too large to create a detailed plan of in the CSF, due primarily to time constraints and the desire of the author to survey as many unique features as possible in the week’s time allotted features in the Daer. Because of the accuracy and detail in the stair turret plan, the CSF survey focused predominantly on surveying that segment of the tower, creating a fresh plan for comparison to the original BAG plan. It was hoped that there would be few differences between the plans (e.g. measurements would match up, and stones would still be indicated in the same places), as that result would indicate little erosion effects of the reservoir and little deterioration of the site overall. Stair turrets, because of their obtrusion up and in the water column, and their careful construction, would hopefully constitute the weakest part of the structure (BAG 2013), thereby revealing even small changes in overall condition.

Photographs and videography recorded during the first, exploratory dives revealed a large foundation, matching the description recorded by BAG in 1995: walls greater than a metre thick, standing at a height of almost two metres tall. The floor of the structure had a fine layer of silt spread across it, easily seen with just a light brush of the hand over the surface, although the silt resettled on the floor surface within minutes of suspension. A general plan that corresponds roughly to the plan created by BAG was completed first (figure 49). The stair turret on the north

side of the tower was located, and it was to this spot that a surface marker buoy (SMB) was deployed for ease of future location, ascent and descent. A square, one X one metre grid was lowered to the top elevation of the stairs and the stair turret was carefully planned (figure 47). A second, high definition set of video footage was taken and this is available for viewing on disk (DA-Disk).

Preliminary results of the measurements and photographs taken suggest that the structure is well preserved and undamaged by the reservoir. The individual steps were all visible without needing any brushing away of sediment, although the bottom sediments were extremely fine and this led to occasional black out of the water, making good photography difficult. The steps appear in good and 'surface quality' condition. The stones that formed the topmost layer of the foundation walls were in place, in exact or near exact accordance with the 1996 BAG plan. Neither siltation nor water action has caused erosion that is visible to the naked eye, with all measurements very close to the 1995 survey results.

#### **Mound, unknown structure-purpose and associated Sheep fold (DA02)**

Approximately .65 kilometres north of the Kirkhope tower, BAG investigated and surveyed a large mound of unknown purpose and an overlying sheepfold. RCAHMS records indicate that the mound remains of unknown purpose (RCAHMS, 2011). Finds associated with the mound include two lithic scatters, located north/north east of the mound, some 5-8 metres away. The structure overlying part of the mound, which appears as a large grouping of pale boulders, is thought to be the remains of sheepfold and this structure is meant to be located in the north-eastern quadrant of the mound.

The CSF was comprised of the underwater survey of the mound, which is still attached at its north/northwestern quadrant to the ‘mainland’ by a thin strip of raised ground (figure 59). Results of the survey indicated a mound of yet-unknown purpose measuring 60 metres in total length along a north-south baseline. The parametre of the mound measured at two depths. The first measurement point, accomplished through trilateration from two markers on the baseline, was made at the break of slope and done at regular 10-metre intervals until the total circumference of the mound was established (figure 50 - 53). A second set of measurements was made, again using the same trilateration technique at 10-metre intervals, 5 fin cycles past the first noted point. Each fin kick cycle equaled approximately 2 metres of swim length, and so the second set of measured points were all approximately 10 metres from the original, break of slope point. Secondary circumference results indicate a regular slope gradient at 35%, and a regular depth at measured points at between 2.5 and 3.5 metres deep, with a more gradual gradient at the south/southwestern ‘tip’ of the mound. These results indicated a small amount of change in the composition or distribution of the mound and its soils and stones (figure 51).

The pile of boulders, thought to be the remains of a sheepfold (figure 54) was located at a depth of 2.5 metres. Its position, nearly identical to the map point provided by the RCAHMS (2011), has been uncompromised so far. It exhibited little or no signs of erosion or movement. The sheepfold is located at the break of slope on the exact opposite side of the mound’s plateau surface but its opening faces east (in compliance with the RCAHMS details). Conditions of the structure, compared to its description, are excellent. The boulders and stones that make up the

structure are in the same locations, and despite the changes in water level, what seems to be the original peat and assorted flora are still present and visible (figure 55 - 58).

Of the lithic scatters discussed by the RCAHMS (2011) and Ward (1995), no further lithics were discovered. This may have been because BAG was very efficient at their field walking endeavors and removed all of the associated lithics from the site. Alternatively, the lithics may have been swept away by faint currents and relocated further up the reservoir in uninvestigated waters, or been sufficiently covered by new silts to remain invisible to divers.

#### Cairns (DA03) (figure 60, 61)

Unfortunately, due to accessibility problems at the time of the CSF, the two cairns listed for survey were unfit for diving. A lack of road access made attempting the dives to locate the cairns impossible for several reasons. Most problematic was a lack of accessibility in the even of emergency. If dives had been attempted from the opposite side of the reservoir (i.e. entering the water from the western side, rather than the eastern side), divers would swim an estimated kilometre before descending to begin the search, before ascending and again swimming a kilometre to shore. These swims alone would exhaust even the fittest of divers, and the attempts were aborted.

### **7A.6 Fruid**

Investigations in the Fruid involved a new and different typology of features, also after conferring with Tam Ward on a number of occasions (figure 42). There was no investigative dive area, but instead a more diverse set of features that

included: the remains of the Fruid Castle, the Fruid cottage and workshop, and two Bronze Age settlement platforms. A field boundary wall was added to this list and impulsively recorded given the easy and immediate cross comparison on the tracts of wall that emerged from the reservoir on the western bank that had never undergone submersion. However, strong evidence of shoreline fluctuation zone erosion was present across the perimeters of the reservoir (figure 63). The work conducted in the Fruid lasted one complete week (seven days).

#### Fruid Castle (stoneworks= FR01; earthworks= FR01a)

The first feature investigate in the Fruid was the remains of the Fruid Castle. Most of the survey was accomplish through snorkel equipment, rather than SCUBA due to the 30-minute maximum bottom time divers faced on SCUBA. The remains of the castle lay in less than 2 metres of water, and at times navigating the remains proved difficult altogether, even with free diving kit kept to a minimum. Waterlogged sediments under foot made walking the terrain was impossible because risk to potential underfoot features needed minimized, but swimming was also difficult since there were times when the water level was less than .5 metres. Eventually, however, the site was carefully navigated with photography, videography and a site plan accomplished through the use of semi-circle search patterns, starting on one side of the castle, and swinging out across the width of the remains (figure 64).

The Fruid Castle showed signs of pre-inundation degradation, and this received confirmation through the inspection of aerial photography of the valley and conference with local and long time farmer, Mr. David Robertson, who lived in the Fruid Valley for over half a century. He confirmed that the remains never received



the attention of archaeologists or antiquarians pre-reservoir filling. The trees that were once considered the centre of the castle site were reduced to reed covered mounds, the trees long since removed by Mr. Robertson, who admitted to removing them and drying them out during a dry spell some years earlier that allowed him access to the area. That the foundations sustained debilitating damage is confirmed by the lack of entry on any UK Map provided through the National Library of Scotland, dating back to 1600 (NLS 2011). Other buildings dating to approximately the same period were built by the same family, the Frasers (RCAHMS 2011).<sup>59</sup>

The castle foundations consisted of a combination of stones and earthen banks/earthworks (figures 65 - 69). There was no evidence of mortar. At present, the earthworks are still present and apparent, from aerial photographic evidence, in-water viewing and from ground level observation. The actual castle site is meant to have sat on the raised area of ground that is within the southwestern quadrant of the visible earthworks, and in this area, many tiny and tightly packed stones and pebbles are present; whether they are directly associated with the original Fruid Castle or later activity is yet unknown (image FR19). The entirety of the feature was greater than 2.5km from the dam head, nestled in the area that is noted on the Ordnance Survey 6" map from 1860 as "Ford"<sup>60</sup>, and posed no overwhelming safety risk to the dive team. Despite being recognizable and photographable, the earthworks associated with the castle showed signs of damage and erosion, although the current floral growth seems to be protecting the entire area from the type of sediment (silt) removal and erosion that is happening further north in the reservoir (image FR17).

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<sup>59</sup> E.g. Oliver Castle, which was built immediately after the Fruid Castle around the middle of the 12<sup>th</sup> Century ad. Oliver Castle, now also reduced to a wooded field with few signs of foundation works left remaining, is located less than 5km up the down the Fruid Waters, on the west bank of the river.  
<sup>60</sup> despite the lack of map-based recording, the RCAHMS provides details of the feature and a brief historiography of it.

Nevertheless, sections of land that constitute earth banks show some signs of erosion from change in the reservoir water levels (figures 73 - 77). A large set of possible field boundary walls, date and association with the castle site unknown, run across and through the earthworks (figures 70 - 72). These walls are toppled over and trail off in some areas (picking up again some metres away), and appear to be in very good shape in the segments that were not intentionally toppled. The walls, due to their proximity and overlay with the castle grounds are called “castle walls” on their damage assessment form- this however, is a misnomer, and the demarcation was only used to denote their location within the Fruid, and this should not convey that these walls are actually related to the Fruid Castle (or were misconceived as having been).

#### Boundary Walls (FR02)

Encroaching upon and adjacent to the Fruid Castle grounds, runs a large set of boundary walls that span the width of the Fruid Reservoir (figures 70 - 72). The walls measure approximately 1m in thickness, rising from .5m to 1.25m from the ground. Its depth varied according to the depth of the reservoir, varying from above reservoir level to 12m in depth. The entirety of boundary wall was followed (dived along), in the attempt to find reasonable signs of damage or deterioration to it, with special focus on its condition in the draw-down zone. It displayed no signs of deterioration brought about by the reservoir, its only discontinuity a length that is toppled over (figure 78). This toppling event could not be linked to water movement from the reservoir, as it was not along any denoted channel or particular current, and it occurred below the draw-down zone level, perhaps indicating that this break in the wall dated from before the reservoir’s inundation. The length of boundary wall

underwater was full of aquatic plant life, either through the protection it afforded algae to take hold, or because of the trapped sediments between its stones that allowed mid-water column light and sediment in which to grow (figure 79). Neither algae nor lake grasses seem to have a negative impact on the wall, as no stones were at danger of being pushed apart or over by the light growth. It is possible that this light but persistent growth will help maintain the wall's integrity in the long term, rooting itself in the crevices of the stones, and keeping them more impervious to the effects of erosion or hydro-action.

#### Fruid Workshop (Carterhope farm) (FR03)

The Fruid Workshop is located on the western side of the Fruid Reservoir, approximately 20 metres from shore in 4-6 metres of water. The workshop covers a sprawling 32 metres across by 32 metres long, the entire area within a chaotic tumble of broken bricks, mortar, piping and other construction materials. The walls of the workshop were knocked over before inundation of the reservoir, and none of the remaining rubble was cleared away, leaving a "perfectly" *in situ* workshop that has undergone very little post-inundation disturbance. Lying approximately 2km from the dam head, it has sustained little overall deterioration or observable distribution, despite also lying in the draw-down zone. This stability may or may not be derived from the fact that the construction materials are heavy and durable, and large sections of wall and debris are still mortared together. It cannot result from the workshop's situation in a small 'bay' within the reservoir, for it is at this point that two small inlets meet and flow northward toward the dam head.

#### Fruid Cottage (Carterhope farm cottage) (FR04)

Less than five metres from the Fruid Workshop in approximately 5-7 metres of water and associated with the workshop structure is the Fruid Cottage. The cottage is composed of a mix of brick, mortars and stone, and this structure, too, was demolished (but left in place) before the Fruid was filled. It remains, much like the workshop, in good *in situ* condition, with elements of the cottage still recognizable: the path that led from the front door to the gardens, the front door, chimney, and quite surprisingly an early 20<sup>th</sup> century shoe, which lay at the entrance to the front door, completely undisturbed by the various hydro events from the past decades. Although the cottage remains are in slightly deeper water than the workshop, it is also still within the draw-down zone at the mouth of the small inlets. The Fruid cottage shows little signs of deterioration or redistribution; the only deterioration that is noteworthy is that single shoe, the leather of which is undoubtedly weakened by the long years of submergence and drying out.

#### Fruid Workshop and Cottage Survey

The Fruid cottage and workshop were both surveyed at the same time. Following the laid out methodology, a long baseline was established running north-south, through the approximate centre of the two structures. Measurements from the baseline were triangulated, with divers working in teams to manage the handling of tape measures and taking accurate measurements. Due to the sprawl of the structures and the difficulties in visibility, all measurement points were taken at the furthest continuous edge of the structural remains. Outlying pieces of brick or mortar were noted, but did not form part of the actual circumference of the structural boundaries. In this way, any future distribution of the features will be easily interpreted through

basic measurements, as the edges of the features will, if any redistribution occurs, expand out, providing larger and larger plans of the structures.

In addition to planning the features, videography along the baseline was taken. The author's hope was to compile still images from that videography into a long cross section photomosaic of the feature in an attempt to provide one long photo record for future site comparison. The videography was a success, but a full site photomosaic proved too great a challenge due to the poor visibility in the footage and tremendous size of the files involved in extracting what would amount to over 3000 still image captures, after factoring in the overlay necessary to create such a massive mosaic. Future endeavors on the site will involve using a higher tech camera, mounting system and integrated software to streamline this process. The videography presents images that are clear enough for the viewer (but not a computer) to discern the layout of the tumble of bricks and mortar that constitute the site and the features' edges. Therefore, footage taken along the baseline of the workshop has been processed into a photomosaic, representing an area the length of the workshop x 1.5-2m wide (figure 80).

The workshop measured approximately 25 meters in width, while the cottage measured at approximately 20 meters. The Fruid Workshop was situated at a depth of 4-6 meters, its northern and western quadrants sitting a little deeper than the east and south. The slope it rests on continues down to the Fruid Cottage, which sits at the slightly deeper depth of 6-8 meters. A boundary wall crosses between the workshop and cottage, and is demarcated on plan (figure 80) although exact measurements of it were not taken.

Bricks and mortar were found at the site and all seemed in reasonably good condition (figure 84). There was little evidence of erosion. At the cottage, large stone slabs of flooring and planking were still visible, though slightly silted over (figures 85 & 86). Carved facings on stones and bricks were still visible, and the underwater photographs of these were compared to the images taken by BAG (figures 81 - 83).

#### Unenclosed Platform Settlement (UPS) (FR05)

An unenclosed platform settlement, located on the west bank of the Fruid and excavated by BAG, was located via GPS. The site, fully excavated previously, was located by the pits and trenches still apparent in the underwater topography. No measurements or recordings of the excavated feature were made, as these results already exist in the reports by BAG (Ward, 2004). Instead, the relocation by volunteer divers of this difficult to locate set of features (due to the fact that the entire UPS was flat or dug into the earth, and then further obscured by the caving in of excavation walls) represented a success unto itself. There was no apparent exposure of new features related to the UPS.

### **7A.7 Megget Reservoir**

The features in the Megget Reservoir (figure 43) presented yet another set of varying typologies, ranging from stone to earthen, and ranging from late Neolithic to modern. The Megget was the deepest of the reservoirs dived in and extra precautions such as measuring out distances from the tower inlets and keeping even closer track of dive times, with two rescue dive teams at the ready for each dive Rota ensured greater diver safety.

The first unique feature investigated in the Megget was a set of buildings known as Cramalt Towers (figures 87 & 88). Cramalt “Tower” was initially surveyed and excavated by researcher, Alastair M T Maxwell-Irving, during a period through 1977-79 (Maxwell-Irving 1981). Cramalt Tower, as it was then referred to, was considered a great loss to antiquarians, as the remains of the old Border stronghold would disappear “forever” making it therefore “...essential that a new survey be made of the ruins and as many surviving features” (Maxwell-Irving 1981: 401). Maxwell-Irving’s investigations began on only one feature of the old Cramalt building: the ruin of a tower-house, now known as the “North Tower” (figures 89 & 91). A second tower at Cramalt was uncovered, though no earlier mention of it either by the Royal Commission or other writings existed (RCAHMS 1957). This second or “South Tower” backed against an adjacent wood where the original ground level was higher and further obscured by scrub brush (Maxwell-Irving 1981). Upon removal of the brush in the clearing of the area for excavation teams, that wall was uncovered and it was not until excavation was well advanced “...that it was established that the new building in question was no mere outbuilding, but a second tower-house... marginally smaller than the North Tower, but considerably more sophisticated” (Maxwell-Irving 1981: 413) (figures 90 & 92).

Cramalt now sits in 32 metres of water, nearly 150 metres out into the Megget. In order to reduce diver fatigue and cold exposure, an inflatable rowboat ferried divers, a rescue diver, oxygen, and equipment out to the marker buoy. Upon reaching the buoy, divers donned kit and descended along the buoy line with extra torches, due to low light penetration and poor overall water column visibility. Dives

were limited 15 minutes, as that time period represented the maximum in no-decompression limits set by US Navy Dive Tables and the Recreational Dive Planner. This 15-minute period included descent to the feature and all works undertaken, up to the moment the dive pair began their ascent back to the surface. On the basis of Maxwell-Irving's description of a larger, more robust tower and a smaller, but more sophisticated tower, the dive team was prepped to look very closely for signs of erosion or fragmentation on both towers. The team jointly theorized that the sophisticated South Tower may show greater signs of aging and decay, but no evidence was gathered that suggested the south tower was deteriorating at a faster rate than the north tower. Both tower ruins were in relatively stable condition, showing no outward signs of erosion or collapse in the short term.

Because of the limited visibility by suspended particulates (which worsened at depth), photography of the feature was a difficult and frustrating task that resulted in unusable imagery, even with flash diffusors attached to the variety of cameras on site for this feature. Therefore, the structure was observed, surveyed and using a standard drawing grid. One diver completed drawings while the other monitored air, time and assisted in the management of measuring implements.

A plan of the first floor of the North Tower measured 11.28m X 8.75m (figure 93), with wall thickness measurements taken only at the top recesses. At their uppermost point, walls were 1.4-1.65m thick, with variations in measurements due to changes in the sizes of stones jutting from the sides of the walls. Maxwell-Irving's measurements of the same walls came to 1.52m in width (Maxwell-Irving 1981: 408). This signifies that no dramatic erosional events had likely occurred against the surfaces and tops of the walls occurred in the time since the structure was



flooded. Plans of the layout of the South Tower indicated the same results (figure 93). The South Tower measured 10.68m X 8.06m. Nevertheless, this small discrepancy along the lengths of the walls were regarded as within an acceptable range while working underwater, and were not understood to indicate erosion or distribution of an otherwise stable structure. No visible erosion, abrasion or toppling was apparent. It was obvious to the team that the ground level had risen since Maxwell-Irving's survey, as the lower levels of the feature were completely indistinct, and the cellar was completely unapparent, saving the knowledge of where it was as corresponding to plan comparisons.

Small-scale drawings of the wall sections for juxtaposition against Maxwell-Irving's took the remainder of allotted time for this feature. While Maxwell-Irving completed whole elevation sections of the South and North Towers, divers undertook to draw sections of the towers due to underwater time constraints (figures 94 & 95). Wall sections compared to the original drawings appear whole and unchanged. Obvious changes occurred in the ground level, with sections from the CSF indicating increases in the ground levels up to one meter on external facings of walls. This is doubtless the result of sedimentation drift and redeposit against the structure. Increase in surrounding ground level was indeterminable, but in all likelihood, the surrounding ground is covered in current-drifted sediments.

#### Cairn (ME02)

At the west end of the Megget in the much shallower waters of 5m, the team investigated one of many cairns identified by BAG. The dome-shaped cairn measured 6m long by 2m wide, and was approximately 1m high (figure 96). It remains only slightly dispersed on the lower south side, while the other sides remain

intact (figure 97). Amongst the stones of the cairn, one potential quern stone was easily recognized but left *in situ* and drawn as such by divers (figure 98). Neither did visible redistribution of the stones seem apparent, nor signs of erosion.

### Megget Knowes

A set of three distinct features combine to create what was called on 1<sup>st</sup> edition OS maps as “Megget Knowes”: a 19<sup>th</sup> century building, iron water pipelines and a brick cistern into which the pipes enter (figure 99). Each of the features were investigated separately since the building materials though modern, were all very different, but bearing in mind that they form the large feature of Megget Knowes,

#### 19<sup>th</sup> century building/shed (ME03)

The demolished remains of a small structure, constructed of mortar lay in approximately 5m of water (figure 100). The extent of demolished area measured approximately 5m X 5m. Debris unrelated to the building, such as modern fence posts and tree branches, were strewn about the structure and it likely that these modern pieces were washed amidst the debris during a period of extremely low water levels. It was not determined possible to ascertain rates of erosion on the demolished structure, although no distribution of the debris was apparent, much of it covered in sediments and small amounts of algae. The CSF produced two drawings of the structure, one a general plan, and another focusing on a pair of crossed boards and a piece of tree branch, hoping to use this drawing in future visits to determine if and to what extent the site debris and the natural intrusions would be redistributed (figures 101 & 102)

#### Iron Water Pipes (ME04)

The iron water pipes that connect to the brick cistern were visible in the BAG report, identified as sitting exposed about 1m below the original ground level (figure 103). Diving on the pipe revealed the same situation. The pipe, which was greater than 10m in length, and approximately .1m in diameter, remained heavily exposed, running from the demolished building, into the cistern (figure 104). In one place, the pipe still lay buried under the original ground level, although evidence for why that ground had not eroded away was not present (figure 105). Having undergone periods of drying out and re-submergence, the iron was in remarkably good condition, showing signs of rust but still solid all along and throughout.

#### Brick Cistern (ME05)

The brick cistern lay in deeper water than the majority of the iron pipeline, and capped by a single, large slab of red sandstone. That red slab is now broken in half. The cistern, at a depth of approximately 5m, lay in a lee area, protected by a small mound that jugged out into the deeper area of the reservoir. However, despite the protection from stronger currents and sediments, the feature is still degrading and showing a small-moderate amount of erosion. The top left corner of the cistern's facing, composed of mortar, has pulled away and broken from the main structure, leaving more brickwork exposed. Divers carefully removed some of the small-moderate growth of algae and fresh water grasses so that the feature could be drawn and photographed more clearly (figure 106). While this feature is not in any immediate threat, its position in the draw-down zone of the reservoir, combined with the changes in water and air temperatures it suffers on a yearly basis, will lead to the continued degradation of the mortar facing.

## 7A.8 Camps Reservoir

The Camps Reservoir (figure 44), completed in 1920 in South Lanarkshire, represented the southernmost reservoir investigated during the course of the fieldwork. Due to an overlap with fishermen, eager to utilize the reservoir's facilities without the presence of archaeologists, investigations in the Camps only lasted three days, rather than the six planned. Therefore, the proposed set of features were modified, and plans to draw and photograph shortlisted to the writing of observations and taking of underwater notes about features. Observational investigations or "exploratory dives" centered on a localized ring enclosure that contained a cremation burial site, a cairn and a burnt mound.

### Cremation burial site (CA01)

Although surveyed by BAG in 2007 (Ward, 2012), no evidence of a cremation burial site existed in the Camps. Divers descended in multiple successions, each time in slightly different locations to accommodate the potential for misaligned GPS coordinates or errors in GPS conversion (from OS map coordinates), carefully searching the silty bottom for signs of cremation burial, changes in sediment colour or texture, or caved in pits where BAG excavated. No observations were made and this feature produced no data, as a result of not locating it. However, the lack of locating the feature does not inherently mean that diver technique was inadequate or that GPS coordinates were incorrect. Instead, this occurrence suggested to the author, and divers on site, that the feature had simply been eroded away by the years of exposure to changing water levels in the Camps, and it is therefore listed and referred to in this dissertation as destroyed/eroded.

## Burnt Mound (CA02)

The second feature investigated in the Camps was a burnt mound, also identified by BAG (figure 107). It included no diving. On approach to the first dive entry point, a long swath of burnt mound material, identifiable through appearance and confirmed through GPS coordinates, was recognized close to the water's edge and trailing just down into the water ( $\leq 1\text{m}$ ). The mound, measuring approximately  $2\text{m} \times 1.5\text{m}$ , and was less than  $.1\text{m}$  thick (figure 106). Measurements were taken using the hollow end of a ranging rod, but these measurements were largely unnecessary in many places the burnt mound material was washed away to such an extent that clean sand showed through in patches up to  $1\text{m}^2$ . Representing the worst observably preserved feature encountered throughout the field work period, the burnt mound, as a feature composed of all natural 'earthen' elements, sustained all of its damage through the erosive effects of water level change.

## Cairn (CA03)

One cairn, close in proximity to the other features, was located in approximately  $6\text{m}$  of water. Although no photographic evidence of the feature exists all notes, as compared to the photos and descriptions from BAG, suggest that the cairn is in stable condition, showing no signs of observable site redistribution or erosion on the stones. No evidence of original sediments or peats seemed to exist within the stones forming the feature, suggesting that those sediments, similar to the fate of the burnt mound, were eroded away with the changing water levels associated with the draw-down zone.

## 7A.9 Talla Reservoir

The Talla Reservoir (figure 42), completed in 1905 (Tait 1905), represented the oldest of reservoirs investigated during the fieldwork. No complete surveys of archaeological features exist, although the Biggar Archaeology Group observed what Ward (2010) describes as “an extensive archaeological landscape... both above and below the high water level”. Discussions with Ward before fieldwork commenced led to the conclusion that dives in the Talla would best be utilized as exploratory dives, used to determine to what extent an archaeological landscape might be observable below the high and low water marks. Unfortunately, a week’s worth of diving in the Talla produced no results. No evidence of an archaeological landscape (e.g. flint scatters, cremation pits, ring enclosures, mounds or cairns) were observed. Upon conference with BAG, Ward suggested that it seems reasonable to assume that many features may have been destroyed without record during the quarrying operations, and that the size and significance of what is still a major ritual landscape of Bronze Age activity would have been even greater. And although Ward (2010) claims that up to 33% of the archaeological landscape at Talla may have been obliterated, it seems even more likely that the over a century’s worth of dramatically changing water levels nearly completely obliterated, through erosion, all evidence of the Bronze Age activity and landscape that once was likely to exist. Although high-powered torches lit the floor of the Talla for searching teams of divers, both the author and Ward concur that another investigation of the Talla is necessary before presuming the complete destruction of all archaeological features. Both author and Ward suggest that a walkover survey at the next possible low water period takes place in conjunction with simultaneous dive survey below the low-water mark. The RCAHMS suggests a geophysical survey of the underwater topography and

concomitant archaeological features, although the nature of the Bronze Age landscape at risk and at question in this instance may not appear in geophysical data.

## **7A.10 Upper Glendevon**

The Upper Glendevon Reservoir (figure 45) is located in the Central Belt of Scotland, the Central Belt also known as the Midland Valley. The Highland Boundary Fault and the Southern Uplands Fault contain the region, which at its centre also contains the Ochil Valley Fault. The Ochil Hills dominate the area surrounding the Upper Glendevon, and it is among the valleys of the Ochil Hills in which the reservoir is situated. Most of the Central Belt rests on the remains of a chain of volcanic islands, formed in the Lower Devonian Period (Francis et al 1970). Superficial deposits are characterized by sandy till, “giving rise to sloping terraces commonly with distinct uphill margins against the higher ground of the valley sides. The courses of existing streams cut deeply through these deposits into bedrock. It is evident in places that the deposits shown on the geological maps as till are composite, with intercalations of stratified silt and gravel” (Coates et al 1991: 17).

The River Devon, which flows down from its origin in the Ochils, was dammed high in the hills to form the Upper Glendevon Reservoir and a kilometre further down river to form the Lower Glendevon Reservoir. Areas of flooding along the course of the Devon, and the over-flooding of wetlands, prompted the World Wildlife Fund in Scotland to start studying the region more in depth, culminating in the creation of a report and set of recommendations about best managing the wetlands and flood zones (WWF 2010). Archaeological works undertaken by the PKHT and commercial archaeology company, CFA Archaeology Ltd, reveal the

soils in the draw-down zone and surrounds as a brownish- orange clayey-silt, overlaying natural sandy gravels (Suddaby 2010). Further analysis of the soil and substrate compositions and the exact proportions are unstudied in this reservoir, either for the purposes of the associated fisheries or hydrology of the catchment area.

Following a period of drought in 2003, archaeological features in the Upper Glendevon became exposed. A walkover survey conducted by a team from the Perth and Kinross Heritage Trust (PKHT) was followed by a more intensive survey and excavation run through the RCAHMS. In the period preceding the CSF fieldwork, plans were drawn up with the assistance of the PKHT to hold an underwater survey of several of the sites investigated by the two 2003 teams. The sites decided upon included Site 14, which was a large mound with a cist atop and motte around resting in the northwest quadrant of the reservoir, Site 10, a square barrow that lay in the southwest quadrant, and a farmhouse that sat in the southeastern quadrant of the reservoir. Because distances to the features were often in excess of 500m, a semi-rigid boat, lent by the Perth and Kinross British Sub Aqua Club diving group, was used to transport divers, equipment, emergency equipment and rescue divers to and from dive locations. The boat ride to and from dive sites took approximately 15 minutes each way, decreasing the total number of dives possible on each feature. Therefore, features were surveyed and drawn as the preferred recording option, allowing limited time allotted for photography, although some photographs and videography are appended.

Site 14: Mound, Cist and Motte (UG01)



The feature investigated, known as site 14, lay in approximately 4 meters of water when the CSF team dived on it. As noted by the RCAHMS (2012)<sup>61</sup>, the cist had already been excavated and the team found no sign of this excavation, even though the shallow water and good visibility would have allowed easy identification of excavation areas (figure 109). The stake used by the PHKT and RCAHMS team to survey points on the cist was found still *in situ*. The surface marker buoy was attached to this point. A plan of the mound and surrounding motte were drawn out, using a baseline and triangulation to 3-meter increments along and down the profile of the feature (figure 110). On the northwest side of the mound, what appeared to be the RCAHMS test trench appeared to be dilapidated condition, with walls badly sunken in and washed sediment concaving the bottom of the trench. Whether the sediment at the bottom was from the trench walls or washed in from elsewhere in the reservoir is unknown, as no samples were collected. The mound appeared to be in mediocre condition, having eroded on both sides. The south side of the mound was more heavily eroded, as compared to the more moderate erosion on the north side (figures 110 & 111). Nevertheless, the mound is eroding at a rapid pace, and the sides of it are now sloping down at a dramatic angle, which will increase the rate at which it continues to erode. Contrarily, the adjoining ramparts or earthen mounds surrounding the main, central mound seemed in similar condition to the photographic evidence, i.e. showing little observable sign of erosion. This suggests that the mound itself, higher in elevation than the motte at the bottom, is succumbing to the greater effects of erosion due to the increased exposure to the changing water levels.

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<sup>61</sup> The RCAHMS team fully excavated the cist, which sat atop the knoll. It had been almost completely destroyed, due to the constant rising and falling of the water level. The remains of the cist consisted of one end slab, two side slabs, and a base slab. The stone sockets were excavated, but no artifacts or skeletal remains were recovered, although whether this was due to a complete lack of evidence or the water level changes' destruction of them is unknown.

On the last day of diving operation in the Upper Glendevon, the team turned its attention to a modern feature, a farmstead. An old farmstead, noted on the 1<sup>st</sup> Edition OS 6-inch Map (Perthshire 1866: sheet cxxvii), was comprised of one main building and associated enclosures. The farmstead was recorded again in 2003 when the RCAHMS team noted it via oblique aerial photography (RCAHMS 2012). Although a full survey was not conducted on either the farmstead or associated fields (walled in), the team believed it a novel opportunity to determine, almost a decade after its last emergence, whether the structure still seemed in good condition. The team also wanted to explore whether it, as a feature in deeper water, was locatable and in clear enough water to be observed or recorded.

No photographs were taken of the farmstead or its surrounds due to the turbidity of the water. The main building, sitting at 18m deep, was still upright, with no signs of a roof. Divers did not enter the structure for safety reasons. Field walls and boundaries appeared as intact as photographic evidence from 2003 indicated. Little sign of erosion occurring around the base of the structures was evident, nor were there any observable signs of redeposited soils. This dive was a success in that the farmstead was located, with diver notes made of the structures. Visibility, though limited to <3m, was good enough that diver safety and confidence were not compromised. Only time limitations on the diving day were responsible for the lack of drawn or photographic record.

**Site 10: Square Barrow****(UG03)**

Site 10, a square barrow, “occupies a small rise on the edge of a terrace” in the southwest quadrant of the Upper Glendevon (RCAHMS 2003). It was planned in

detail by the excavating team in 2003, and the CSF dive team undertook to redraw the feature in an attempt to determine if and to what extent the feature had been redistributed in the near-decade since its last survey (figure 113). Locating the feature proved difficult, for although the reservoir floor was free of other stones, complications with GPS systems led to a great deal of time searching for the small rise. When it was finally found, it was drawn using a baseline and underwater drawing frames. A 1X3 meter area was drawn using 1-meter drawing frames (figure 112). Very little redistribution of this feature, located in a mere 4-5m of water seems to have taken place, based on comparison of the RCAHMS plan and that drawn by the CSF team. There was no observable evidence of erosion or redeposited soils, perhaps owing to its relatively leeward position in the reservoir, or the closeness in proximity to each other in which the stones were positioned. No intrusive methods were used while surveying this feature, although the team took special care to be aware of any signs of artefacts, burial or features associated with it (in the vicinity), which may have become apparent since 2003. No further signs or features were observed.

## **7A.11 Challenges**

Due to the diverse nature, English language skills and range of experiences of cold water diving held by the large number of volunteers assisting in this project, a five-day induction period was held during the week prior to the start of actual fieldwork. Basic reviews of rescue diving, underwater signals and navigation, as well as a brief introduction to underwater archaeological methodology were all provided. Each diver was assigned an equipment readiness sheet, which was filled in

at the start and end of each diving day, logging information such as the type and amount of equipment they used on that day's dives, their air in and air out figures, their dive classification (based on the International Recreational Dive Table standards), and overall thoughts or commentary about the day. For volunteers arriving later in the CSF period, an entire day was dedicated to reviewing basics before the diver was allowed access to the reservoirs.

Throughout the course of all of the investigative surveys undertaken, a number of unforeseen challenges arose. These challenges, while not a hindrance to the overall success of the project's objectives (i.e. providing new and comparative data for use in this thesis), need discussion, as any future director of mid and long-term monitoring efforts will surely encounter these, or other like-challenges. The challenges discussed here are also particularly relevant in considering these mid and long-term monitoring actions, since each unique reservoir's geography, the dive crews available for the works, and the 'unforeseeable' must somehow be taken into account. However, the challenges posed here representing a variety of natures do not warrant the exclusion of dive-based monitoring in the greater scheme of submerged archaeological management, in lieu of pre-reservoir excavations and surveys.

Among the most prevalent challenges encountered were those initiated by lesser-experienced members of the volunteer dive teams. All of the divers selected for this project were required to minimally have a "Rescue Diver" certification or better, with at least two years of dive experience. These requirements reflect an industry standard (PADI 2011) and fulfill the minimal requirements of a long list applicable to different types of dive operation set forth by UK HSE diving standards

(HSE 2012)<sup>62</sup>. An interest in or experience of underwater archaeological methodology was also preferred, with all candidates finally chosen having some experience in the field. Nonetheless, individual understandings of archaeological methodology and use of relevant technologies was varied. In the first days of establishing the location of the Kirkhope Tower at the Daer, an entire day's worth of survey time was lost, due to the repeated misreading of handheld GPS displays, despite a day's training in their handling and use. The end of that day found the dive team no closer to locating a well-established feature with very precise GPS coordinates. Further difficulties arose in establishing a baseline on a feature in the Fruid, taking four dive rotations (i.e. A day's worth of diving) to satisfy the baseline's role in crossing the [approximate] centre of the feature, and running from North-South as specified in the CSF methodology. A final, upsetting difficulty arose when a member of the dive team had an anxiety attack while in the water, and as a precautionary measure was placed on oxygen, and barred from diving for the following 36 hours. Although his paperwork and certifications were in good order, the diver had exaggerated his cold and limited visibility diving experience, and as such very nearly created a dive emergency when confronted with both cold and limited visibility conditions. It is not worth discussing the inevitable difficulties in traversing terrains and conditions (e.g. muddy patches, cold days or variable receptions from local populations) as all archeologists must, at some point, trek across spans of earth laden with various pieces of equipment, and it is in only the best of conditions, the underwater archaeologist must also endure this.

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<sup>62</sup> E.G. Diving at Work Guidelines are much more stringent, in that divers working on commercial dive sites (whether excavating or surveying) are required to have a commercial dive license- both expensive (greater than GBP10k) and timely to acquire, with less than .1% of divers in the UK holding this rather exclusive certification (Fort Williams Dive School, 2010).

Most of these challenges can be mitigated or completely eliminated, given the right work strategy and methodological planning; aspects of fieldwork that this, then less-experienced field work director, failed to anticipate. Some of the problems associated with working with less experienced volunteers were expected and, so to mitigate complications that could compromise the validity of this work, some parts of the project were handled solely by the author. For example, due to the potential for the misidentification of features and incorrect measurements, the author made final decisions about the identification of features personally, and before recording attempts began. Sensitive information was also handled by the author- such as the writing of triangulation measurements, and the input of GPS coordinates into the handheld device. Volunteers were given the tasks of support diving, feature location, photography and some drawing, while quality control lay with the director.

Other, less anticipated problems encountered also have solutions. The teams put together for the CSF rotated on a weekly, and sometimes daily, basis, depending on individual volunteer's travel plans. A team of divers that worked together on a regular basis, or who had dived together before would have expedited many of the tasks, from baseline establishment, to the daily pre-dive safety checks. A longer period of volunteer training or a series of training workshops, in the style of the many dedicated evening or weekend workshops that many UK (and other countries') dive clubs hold to keep skills fresh, may have proven effective at familiarizing divers with all types of archaeology specific kit and methodology and kept them up to date, in keeping with the adage "use it or lose it". In the event that local dive groups, many of whom are keen to explore local reservoirs, can undertake mid-term monitoring a dedicated local marine archaeologist, similar in job description and

status to regional archaeologists, could serve to rotate between volunteer clubs to quality control works and methodologies. This approach would involve many members of the community, involving them on a personal basis with submerged heritage and keeping them 'in touch' with areas they feel they may have lost, and allow operations and monitoring to happen at a low cost; employing a regional marine archaeologist and, perhaps, an education coordinator.

## **7B.1 St. Thomas, Nevada (Lake Mead, Hoover Dam)**

It is insufficient to address the issues concerning reservoirs and inundated archaeological sites without taking into account at least one example from the United States, for the publication record concerning this issue has sprung predominantly from the USA. The variability of the American geography allows us to take a very different type of submerged site into account compared to the other features investigated (i.e. single features): the desert town of St. Thomas. Neither ancient in origin, nor of particularly vulnerable construction material (not soil or mud baked brick), St. Thomas constitutes a fair representation of a late 19<sup>th</sup> century town established in the arid southwest of the United States. While the location of both St. Thomas and Lake Mead in the desert may indicate that they hold many aspects in common with Lake Nasser (also geographically positioned in a desert), this is not true. It is true that like the temples in Lake Nasser, St. Thomas has undergone periods of submergence and drying out, and the structures have endured the chemical and biological processes up to this point. Nevertheless, St. Thomas was submerged beneath cold waters that remain at approximately 8°C year round, rather than the warmer temperatures of the Nile River at Lake Nasser (ranging from 16-30°C), and this submergence lasted for almost seventy years: twice the duration of the Philae temples (NPS 2015; Osborne 2012: 209). They endured three periods of re-emergence and drying out, making this small and unassuming town's 19th century structures ideal for juxtaposition against the other two case studies in Scotland and Egypt.



The case study presented here discusses the data compiled through archival, historic and background research. This data compliments the photography and observational fieldwork conducted on site in January 2011. Laboratory research and intrusive fieldwork were not undertaken, because Wyskup undertook these efforts in 2006 and are available in Wyskup (2006). Instead, the research discussed here constitute the case study of a site from its original settlement, submergence and re-emergence for consideration and analysis.

St. Thomas / Lake Mead was visited and recorded in January 2011 as part of this project, and the findings made then are here compared with the results from archival research (Wyskup, 2006) undertaken by the writer. Information on both laboratory results and intrusive fieldwork are reported in Wyskup (2006) and can be incorporated into the analysis. In sum, St. Thomas can thus be studied from its establishment as a settlement, through subsequent episodes of submergence and re-emergence.

## **7B.2 Background of Hoover Dam**

St. Thomas underwent submergence due to the formation of a large reservoir (lake) stopped by the Hoover (formerly Boulder) Dam, conceived from the Boulder Dam Project. To discuss the Boulder Dam Project is to discuss the geology of the landscape into which the dam and accompanying reservoir were cut, as well as to acknowledge the profound complications of harnessing a river as fast flowing and unpredictable as the Colorado River. The Colorado River was typically turbid and unpredictable prior to dam construction, caused by seasonal flooding events (Homan, 1931). Though monitored, those seasonal fluctuations seemed sporadic and without

cyclical intervals, which led to unforeseen periods of drought, flood and unpredictable waterway navigation (Homan, 1931; Pettit, 1935; Lucchita, 1972). President Theodore Roosevelt signed the Reclamation Act in 1902, an Act of Congress that required water users to incrementally pay back the costs incurred in water supply construction projects (US National Reclamation Act of 1902). That act triggered the almost immediate investigation of the Colorado River and its potential uses as sources of reliable drinking and irrigation water, leading to the withdrawal of public lands for reclamation and irrigation works along the lower Colorado (US Department of the Interior, 1964). Two later events elicited the final decision to find a means of permanently controlling the river and reclaiming lands on which St. Thomas sat (US Bureau of Reclamation 2004).

The first of these events was spawned by the creation of the Imperial Canal, in 1901. The Imperial Canal was excavated to bring water from the Colorado River and thought by farmers in Yuma Valley to be a veritable garden of Eden assuming enough water could be transported through it (Sperry 1975). As early as 1904, the heavy silts accumulating from the upper flows of the Colorado began blocking the Canal, which in turn led to the small scale flooding of the Imperial Valley. This small scale flooding continued and worsened. By 1906, flooding intensified to such an extent that it created the Salton Sea: an inland body of water 56 km in length- so long that it became a popular location and profitable venue for netting mullet fish during World War I (Sperry 1975). The second event involved the similar flooding of Yuma Valley, brought on by fast running flood waters that earlier poured into the Gila River (figure 12). Faced by spoiled agricultural products in both valleys and extreme destruction of property, the Bureau of Land Management and Reclamation

became determined to put controls on the Colorado River once and for all. Though the flooding was not the sole reason for the creation of Hoover Dam, it certainly created the impetus that spurred the movement on. A large dam would control the river, as well as provide a source of irrigation and power for future generations- and though not fully realized at that early stage of its conception, create thousands of jobs in the worst recession the US ever experienced (Sperry 1975).

In 1918, Arthur Davis, then Director and Chief Reclamation engineer working under the auspices of the Bureau of Land Management, proposed controlling the Colorado by constructing a dam in Boulder Canyon on the Arizona-Nevada border (Swain 1970). Squabbling between related states ensued over alternative locations for the dam, each insisting that it would be best placed in their state, but by 1922 these debates quieted down (Moeller & Barnes 1971). The first Swing-Johnson Bill (date) authorized the construction of the dam, with all seven Colorado River Basin States<sup>63</sup> finally in agreement over the project. Ground was broken, and in 1933 concrete began pouring into place, thereby alleviating some of the local and regional unemployment tensions associated with the peak period of the Great Depression (Swain 1970). In the days leading up to the groundbreaking works, the United States Bureau of Land Reclamation undertook to purchase through the law of eminent domain, the lands and properties that would be flooded by the lake resulting in the creation of the dam. The town of St. Thomas was just one of many small towns bought over the government, knowing that the towns would be flooded for a very long time.

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<sup>63</sup> Arizona, California, Colorado, Nevada, New Mexico, Utah and Wyoming

Over the course of five years, a concrete, arch-gravity type dam was erected. Construction was completed in 1935, and was followed by the dedication of the dam by Franklin D. Roosevelt (Swain 1970). This dam, now known as the Hoover Dam, in honour of President Herbert Hoover, remains the largest cement, arch-type dam in the USA, with a maximum height of 726 feet, and a reservoir shoreline 550 miles in length (Swain 1970). The project was not preceded by formal archaeological survey, although some reclamation surveys were completed in anticipation of the dam and the subsequent formation of the lake

### **7B.3 Geology of the Lake Mead National Recreation Area**

The Lake Mead Recreation Area today sits in a vast area of arid desert, surrounded by mountainous landscapes, with the fast-flowing waters of the Colorado River intersecting the greater Boulder Basin (figure 13). Two great geologic areas converge here. To the east are the Great Plains, composed predominantly of rolling hills and flatlands, while to the west rise the Rocky Mountains. The north-south aligned range where the two meet is called the Front Range.

About 135 million years ago, sands and gravels were carried eastward over the Boulder area from mountains rising to the west in Utah and Nevada. At about the same time, a massive invasion by the sea began in eastern Colorado whereupon the sea entered the central U.S. from the north and south, laying down a deposit of beach sand along its edge (Runnells 1976). The next 70 million years were marked by several advances and retreats of the sea, with deposits associated with these episodes of marine flooding consist of shale, sandstone, limestone, and some beds of coal the sea slowly withdrew to the northeast, and mountain building began again in

Colorado, forming the present Rockies. As the mountains were uplifted, swiftly flowing streams carried floods of debris and sediment downward to the plains (Runnells 1976).

The Colorado River emerged around five million years ago, at a time when the landscape was dominated by elongate ridges that shed thick fans of sediment into adjoining valleys, cutting into the landscape as it flowed (USBR.gov 2004). The Colorado River began as a descendant of an older river, which flowed eastward; a small stream that flowed from the Lake Mead region into the Gulf of California had been slowly eroding northeastward. That slow but deep erosion eventually cut through the cliffs at what is now the mouth of the Grand Canyon near Pierce Ferry, thus becoming the Colorado River as it is in the present (USBR.gov 2004).

#### **7B.4 St. Thomas**

Located immediately east of Las Vegas, Lake Mead National Recreation Area encompasses 1.5 million acres of land in the Mojave Desert, within the Basin and Range physiographic region (McClellan et al 1980). This region is known for its extreme climate and topography: summer temperatures easily reach 50°C and the lack of shade and ground water sources, paired with the arid and dynamic rocky environment make it difficult terrain to traverse or live in. Archaeological dating from the region indicates that human occupation occurred here as early as the Archaic period, circa 3000BP (Winslow & Wedding 2009). Native Americans continuously occupied the region until the 18<sup>th</sup> century CE, when the area was settled anew during the westward migration from the United States (McClellan et al 1980). Mormon settlers dominated the influx , and in 1865, the town of St. Thomas was

founded at the confluence of the Virgin and Muddy Rivers. It was one of three towns set up within the valley to fulfill Brigham Young's frontier vision: the establishment of self-sustaining 'family' communities, free from the discrimination the Mormons had faced elsewhere from the United States government. St. Thomas's role in this vision was to make a pre-emptive claim to the Muddy Valley region, i.e. arrive in the region first among other west-travelling pioneers, in order to have first claim on the inexpensive and free lands in what is now Nevada. His goal was to establish cotton plantations that would ensure Mormon self-sufficiency, and to found a river route to supply the colonists (McClellan et al 1980). The settlement's state of jurisdiction changed several times: in 1866 it was placed in Utah, and in 1867 it was moved to reside within Nevada, with final dispute settlement arising in 1870. The institution of St. Thomas within Nevada required the residents to pay all back taxes for the years 1867-70 in gold coin, which the Mormon settlers lacked; a majority of the citizens chose to move on. By the end of 1871, most of the original 271 Mormon settlers were gone and by 1880, the city's population hung at a lowly 24 inhabitants (McClellan et al 1980; US Census Records, 1870/1880). Although the town is currently claimed in some writing as an historic foundation for modern Mormon followers and a place where Mormons, the victims of still lingering religious discrimination were evicted from their lands (McArthur 2012), by the time a decision to build a dam at Boulder was reached, the town was not primarily populated by Mormons. Other settlers of mixed religions and origins moved into the region, purchasing or claiming plots of land in and around St. Thomas.

The Jennings family purchased most of the land and buildings given up by the original settlers, improving irrigation to fields outside of St. Thomas, selling

property to incoming farmers and settlers, and thereby bringing St. Thomas to a fore prominent agricultural position in the valley. The addition of copper mining to the local economy drove the establishment of St. Thomas as an integral stop on the Salt Lake City-Los Angeles Arrowhead Trail, which subsequently became State Highway 91. After the turn of the 20<sup>th</sup> Century, track was laid for a spur of the San Pedro & Los Angeles Railroad, which was meant to connect and transfer goods from St. Thomas to the surrounding communities (McClellan et al 1980). By 1918, St. Thomas was a thriving community with a small local economy that supported a general store, grocery store, hotel, café, garage and meat market, in addition to a host of smaller mercantile shops throughout the community (McClellan et al 1980). By the time of the Great Depression, St. Thomas was a small but prosperous community, with a solid local identity, and a small but growing population. As the railhead, traders travelled in and out of St. Thomas, and its reputation as a town where one had the potential to improve their financial status grew. At the peak of its prosperity, several factors led to its rapid downfall: the relocation of Highway 91 (out of the Valley of Fire and St. Thomas), the announcement of plans for the Boulder Dam Project, and a decline in copper prices that led to mine closures and the cancellation of railroad freight services to St. Thomas (Hafner 1967) were all to blame. Although passenger rail services continued, the cancellation of the freight services through which St. Thomas conducted such a large quantity of its trade, spelled disaster for the town's financial stability. It was apparent from the earliest days of planning a large dam at Boulder that the town risked flooding, though some of the townspeople thought the extent of the flooding was exaggerated by federal officials (McArthur 2012). Some among the population therefore decided that when eminent domain

was declared on all landholdings in St. Thomas in 1926, that it was a government tactic to obtain their land cheaply and out from under them (McArthur 2012). By 1932, most of St. Thomas' population had been convinced of the severity of the flooding a large dam would bring, and most landholdings were the property of the United States government (Hafner 1967).

Furthermore, business in St. Thomas had become very poor in the years since Highway 91 had moved, and the Depression had taken grip of the town, and the compensation families received for their plots of land and buildings were likely a good incentive to move elsewhere and try their financial luck elsewhere. Hugh Lord, the service station owner, his station long since dried up of fuel, is credited as being the last citizen to leave the town, having reluctantly left during the night when he awoke to find rising water surrounding his bed (Hafner 1967). There were some small acts of vandalism and last minute attempts by locals to come back to the area and reclaim pieces of property: planks of wood, hastily abandoned equipment and supplies from the service station (McArthur 2012). This stage did not last long though, for within a matter of days St. Thomas very became completely submerged in the Overton Arm of what was filling to become Lake Mead. By June 12, 1938 the town was completely submerged, covered over five days earlier than the US Army Corps of Engineers had anticipated.

## **7B.5 Lake Mead**

Lake Mead's catchment area is approximately 435,000 square kilometers, with a maximum water depth of 180 meters (US Geologic Survey 2012). Its massive surface area of 640 kilometers<sup>2</sup> means that the forces of evaporation, when they act



in combination with high demand and decreased rainfall, the water levels of the Lake Mead dip sufficiently that St. Thomas becomes exposed. The water levels of Lake Mead have always been subject to fluctuation, a combined effect of the dam (filling and decreasing as annual rainfall, evaporation rates, and demand on Lake Mead fluctuate) and the natural flooding and fluctuation activities in the Colorado, Virgin and Muddy Rivers. All of those fluctuations have caused St. Thomas to surface three times over the eighty-year period of the reservoir's existence, and it is unlikely that St. Thomas will ever submerge again, due to increased water pressures in the region and changes in predicted rainfall in the southwest (Barnett & Pierce 2008).

By the early 1950's sediment rates and fluctuation speeds were targeted problems that the Bureau of Land Reclamation was determined to solve. The sedimentation rates were negatively affecting the proposed lifespan of Lake Mead, while the fluctuation speed spelled out unpredictable supplies for increased demand from a newly burgeoning Las Vegas. In order to help restrict the fluctuation speed and variation, in addition to regulate the degree to which sediment was building up across Lake Mead<sup>64</sup>, the Bureau of Land Reclamation proposed the Colorado River Storage Project (CRSP) in 1956. CRSP consisted of creating a series of small dams within the Colorado River upper and lower basins, which include the Mohave Dam (Colorado River's upper basin) and Parker Dam (Colorado River's lower basin). These two dams work at limiting stream flow more efficiently to allocate the mean annual 9,251,100,000 m<sup>3</sup> of water flowing between the different arms of Lake Mead, and acting as a sediment regulatory system aimed at extending the lifespan of the reservoir (Wyskup 2006). These acts, while seemingly tertiary, are directly relevant

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<sup>64</sup> thereby also restricting the dam's life expectancy which was estimated at 280 years without any sediment management plan (Gould 1948),

to the understanding of St. Thomas and how it has survived in that these measures were not put into place to stem the destruction of archaeological resources, although those actions were probably helpful in conserving St. Thomas from the abrasion and erosion associated with draw-down zone features. None of the CRSP considerations or actions were based on conserving archaeology, despite the rise in archaeological awareness in the years preceding the CRSP action (Wyskup 2006). The reduction in sediment deposition throughout the reservoir, one of the effects and functions of the upper and lower basin dams to help extend Lake Mead's lifespan, and limitation on the flux in water levels, reduced the impact on features and structures in the draw-down zone. It was beneficial since that reduction meant less erosive action and less sediment build up. This coincidentally provided a reservoir dynamic in which sets of features were more likely to survive (intact) repeated cycles of emergence, drying out and re-submergence.

Density currents from the Colorado River (as with all river systems) are responsible for transporting sediments that enter the reservoir and then extend throughout Lake Mead (Howard 1948). The subsidiary dams put into place by CRSP limited the suspended sediment concentration, as well reducing sediment deposition in the Overton Arm of Lake Mead. The U.S. Geological Survey's (Covay and Beck 2001) assessment of overall accumulation rates in the Overton Arm produces somewhat complicated results. The maximum depth of core [redeposited] sediment samples taken in the Overton Arm of Lake Mead was 54.5cm (Covay and Beck 2001: 14). Redeposited sediment samples in the Overton Arm were the shallowest of the four samples taken in Lake Mead. This indicates that St. Thomas should have been relatively clear of deposited sediments, as the samples were taken at the

maximum depth of the Overton Arm, and St. Thomas does not sit at that depth when the Lake is full. Despite these low levels of sedimentation, imagery compiled by the Woods Hole Oceanographic Institute in 2003 illustrates this (figure 14). Sedimentation accumulation is visible within the structures in St. Thomas both in photographs taken in May 2005 (figure 15) and January 2011 (figure 16). This sedimentation contributes to structural erosion, although may also provide evidence of the previous periods of the site's emergence through pollen residues and period artefact deposition. Emergence events occurred in 1955 and 1965, leading up to the most recent and seemingly permanent 2003 emergence. It is uncertain whether the lake levels will rise sufficiently to re-submerge St. Thomas, since the most recent drop in levels were a result of increased water usage and decreased snow accumulations. Barnett and Pierce (2008) suggest that changes in climate and yearly rainfall in the southwest will lead to decreased water runoff to the Colorado river, which in turn will decrease water levels in Lake Mead. The re-submergence of St. Thomas seems extremely unlikely.

## **7B.6 Earlier fieldwork findings**

Fieldwork at Lake Mead has only been undertaken during this most recent period of re-emergence from the reservoir, when it was completely dry. Wyskup, in her 2006 season's research, addressed the following issues:

- The processes most destructive to site stability (specifically St. Thomas )
- How has the hydraulic regime within Lake Mead changed since initial impoundment
- What are the possible sources contributing to sedimentation at St. Thomas

- Is it possible to determine sedimentation rates at St. Thomas
- What state of stability characterizes the underwater environment during submersion
- What is the structural strength of the remaining features
- At what scale are erosional processes operating

All of these questions are related to this thesis' aims, but to address all Wyskup's work exhaustively would be excessive. Instead, the writer focused on three issues within her research agenda, which will be analyzed and then compared with results from the fieldwork undertaken in January, 2011. These issues are: 1) the processes most destructive to site stability and the characteristics of stability during submersion; 2) an assessment of the structural strength of the remaining features; and 3) the scale of the active erosional processes that were at work in this area of Lake Mead, and which will be most active should St. Thomas become submerged again.

Wyskup (2006) identified three primary contributing factors to site instability and destruction at St. Thomas:

- erosional processes that result from dramatic fluctuations in reservoir levels (compounded by freeze-thaw while emerged)
- ground composition
- the presence of *Tamarix ramosissima* (Tamarisk).

All of these factors were reinvestigated in January 2011 to determine the full extent of the enduring validity of these factors, as well as provide a snapshot of the features present to which future studies of St. Thomas could be juxtaposed against. Underwater site stability occurs when the features at St. Thomas are at a depth of

approximately -18m in Lake Mead<sup>65</sup>. The town's re-emergence and reinstatement as a terrestrial site has caused greater damage than its periods of submergence. By establishing the most destructive effects, a better understanding of the short and long term condition of St. Thomas is established.

The town of St. Thomas is comprised of 47 buildings set out on a grid of roads on the western bank of the Overton Arm of Lake Mead (figure 17), covering an area approximately 900m X 900m. The buildings were constructed from adobe bricks, formed around a basic wooden frame. Due to the cost of wood in the arid region, most settlers used wood sparingly, turning instead to adobe brick (easily and cheaply acquired from locally sourced, raw materials) and locally sourced, creative materials for roofing and flooring (Hafner 1967: 74). Several of the homes have floors made of hard-packed dirt, while others are reported to have been packed with straw. Only the town church was constructed of wood in the later, booming years of the city, having earlier been made of woven willows and cowhide (Hafner 1967: 68). A few modern houses were built in the twentieth century, constructed from a combination of adobe brick and hardscrabble, but neither the new houses nor the old had electricity or running water (Hafner 1967: 124). The closest thing to sewage in St. Thomas was a long series of ditches running out of the town. Residents collected drinking water in cisterns. Therefore, the materials most prominent in St. Thomas at the time of its flooding in the 1940's still represented lifestyles of the late 1900's, and these included hardscrabble, naturally woven or packed materials and adobe brick (MacArthur 2012). Precious little of the wood remained, since due to its high cost it was the material most salvaged.

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<sup>65</sup> -18m is not in itself the ideal depth for a site to achieve equilibrium, however in Lake Mead this is sufficiently deep to be part of the anaerobic zone and out of the primary draw-down zone.

Erosional effects are the most devastating of the three processes identified by Wyskup, occurring at when Lake Mead originally flooded the town and upon each subsequent flooding and receding event. With each submergence and emergence event, sediments are suspended, transported and deposited, abrading the surfaces of structures and foundations, making the draw-down zone a particularly damaging position in the lake. Freeze-thaw effects while the features are above the water level have hastened the erosion process, making surfaces more susceptible (i.e. fragile) to erosional effects. Although Lake Mead is in the Mohave Desert, known for its extreme heat and arid conditions, extreme diurnal temperature fluctuations occur.

From November to February, the minimum temperature around St. Thomas hovers at or around freezing (NPS 2010). Freeze-thaw creates the potential for adobe foundations to become warped due to expansion and contraction. It also creates an occurrence of spalding, which occurs when freeze-thaw effects concrete, pulling the concrete away from its joined surface over time causing it to split and break away. Over time, that warping leads to cracks, weakening the foundation further. Seiche action is the phenomenon of a standing wave or the oscillation of water in a partially or fully enclosed body of water (Leifson 1948) and can have erosive and redistributing effects on archaeological features. Wind speed, wind direction and water depth are the primary variables contributing seiche patterns in Lake Mead, as elsewhere. Thus, as lake levels drop and St. Thomas 's sits closer to the surface, it becomes subject to this force. At Lake Mead, dominating winds, as elsewhere, orient the waves approaching land, as evidenced in figure 18 (in the form of ridges that appear as crenulations). This results in waves striking the walls of

structures leading to mechanical stress predominantly in the draw-down zone where wave action has its greatest effect on heritage (Wyskup 2006; USGS 1948).

Another factor in long-term site stability at St. Thomas is the ground composition. The ground composition at St. Thomas varies between sandy and silty loams (MacArthur 2012). The type of clay present in these loams has particular destructive potential. Wyskup (2006) determined that smectites are present in the clay fractions of these loams. Smectites are a group of 2:1 phyllosilicate clay minerals, with two tetrahedral silica sheets sandwiching a central octahedral alumina sheet. Expansion occurs when smectites are wetted due to a potassium deficiency that creates weak interlayer bonds, which allow water to penetrate the interlayer space (Warshaw and Roy 1961). Therefore, the initial period of submergence set off a chain of reactions in the ground that inevitably results in the shrinkage (when dry) and swelling of the ground on which St. Thomas rests. The resultant shrinking and swelling creates large, deep cracks in the ground, which in turn contributes to the structural instability of buildings erected on such soil horizons. Figure 19 is a visual indicator of the type of ground cracking that typically occurs when smectites are present.

The final source of potential site instability at St. Thomas is the increased presence of *Tamarix ramosissima*. Since the decline of lake levels in 2003, the evergreen *Tamarix ramosissima*, another threat to site stability, has successfully colonized much of the surroundings of St. Thomas large margins of open space at St. Thomas. Tamarisk, as it is commonly called, propagates well in lakeside margins, and this particular species produces massive quantities of seeds that are wind dispersed. Germination takes place within 24 hours of contact with water (Carpenter

1998). Because St. Thomas and the surrounding area supports the type of habitat preferred by Tamarisk, these quick-growing evergreens have spread rapidly and proved difficult to control. Although burn efforts in 2005 were made Efforts by the LMNRA Exotic Plant Management Team to control the spread of Tamarisk by the use of fire were unsuccessful; the fecundity of the species proved too much, and as a result, it continues to dominate the landscape. Tamarisk compromises the stability of structures, since its roots have the ability to break foundations and walls of features (Wyskup 2006).

### **7B.7 Field observations, January 2011**

Fieldwork was conducted from January 2-12, 2011 with the intention of taking as many photographs of St. Thomas as possible and recording general observations in order to compare both sets of information to Wyskup's work. The initial hypothesis was that in the five years that had elapsed since Wyskup's fieldwork, no dramatic changes would have occurred to the surviving structures nor their surrounding landscape. The author proposed that the changes in site stability occurred when features were specifically in the draw-down zone, but these changes tapered off when the site was either completely submerged or wholly dry. Structures, it was proposed, would be in the same or nearly the same condition as they were in 2006. Larger site photographs were taken without scales, since there were no metered ranging rods available.

The site was non-intrusively investigated. The author concluded that:

- Tamarisk continues to damage structures in St. Thomas. It is damaging to structural integrity, in addition to severely obscuring the view of the town



from walking paths, making it less likely to attract visitors who would fund its long-term protection.

- No erosion seems to have taken place based on photographic evidence comparison, although signs of spalding exists.
- Ground conditions (smectite presence) have worsened slightly. Depth of cracks averaged at 12cm in depth, implying further instances of wetting and drying. The cracks are expanding in depth and width.
- Overall site stability does not seem in immediate danger, but long-term prospects are less promising if Tamarisk and ground conditions are not managed.

*Tamarix ramosissima* continues to present obstacles throughout St Thomas, growing so thickly in places that it obscures building structures completely. The plant has sprung up across LMNRA walking paths, in the center of building foundations, and across the town. St. Thomas is effectively obscured from view by the amount of Tamarisk growth (figures 20 and 21). Estimations of total plant growth and spread were eight times higher in 2001 than their estimated 2005 rates. However, the presence of this even more advanced level of Tamarisk overgrowth does not necessarily ensure long-term site destabilization since park rangers regularly dig up Tamarisk trees that encroach too closely to building structures, in addition to semi-annual burning of the brush<sup>66</sup> (figure 22). This was observed during the fieldwork period, and the incident of Tamarisk within the confines of a foundation was said to be a purely accidental oversight by rangers and field managers (LMNRA

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<sup>66</sup> This invasive action in the ground closest structures may also have destabilizing effects in the long-term. No research has been conducted about the effects of this possibility, but the author hypothesizes that the bioturbation (caused by humans in this case) may destabilize that area of a site or structure, but that destabilization may only become apparent with another period of submergence and re-emergence.

Ranger Interview 2011). Though the Tamarisk risks damaging sites when too close, it may protect them at a distance. Its root systems and foliage provide an erosion-proof zone around the town and protects it from the winds that would pick up and redeposit sediments. Further, by keeping sections of the town less inaccessible, the amount of tourist footfall is reduced, which may deter visitor interference with the site (figure 23). This means a reduction in any incidents involving potential human interference with structural integrity (e.g. tourists interested in prying “pieces of the past” from already damaged building) (LMNRA Ranger Interview 2011).

There is a small to moderate degree of erosion apparent on the surfaces of the remaining buildings. Areas of adobe are scoured smooth and in some places, the adobe is flaking away in small chunks. Nevertheless, the general observations made about the state of materials show that despite the presence of the evidence of erosion and spalding, little difference in the surface conditions of structures exist between 2006 and 2011 (figure 24 - 32). This suggests, as Wyskup considered in her 2006 research, that the most significant periods of erosion, and thus, the most damaging, are when structures are subjected to active submergence into or emergence from Lake Mead. Without seiche action on the features or the town's location within an active and dynamic draw-down zone (i.e. allowing surface waters to suspend particulates at level with features and thereby scrape away at surface materials), the St. Thomas structures are subject to the same forces of erosion as any period, adobe brick structure built in those regional and environmental conditions.

Special attention was paid to the condition of the ground around St Thomas. It was observed in 2011 that the smectite-rich soils had altered since 2006. Across the site, the clustered and cracked grounds, rather than lying flush against each other

had spread further apart: the low levels of annual precipitation, combined with the high temperatures, had caused each cracked panel to curl up toward the sky (figure 33). The chunks of crusted earth were extremely hard, and took the force of several hard knocks with a hammer to loosen even the raised edges of each segment, making it apparent that this type of ground will play a key role in site destabilization in the coming years.

Wyskup comments (2006, 38) that no wooden structures persisted at St. Thomas in any form, but the 2011 fieldwork contradicts this finding: both large tree stumps and trunks, in addition to long stretches of wooden post fencing remain, albeit both are constricted from view by the overgrowth of Tamarisk (figure 34 - 36). While trees are definitely not a wooden structure, their survival is indicative of the potential for wooden remains at St. Thomas, although the likelihood of finding wood, given the financial crisis and relative expense of wood at the time of the town's desertion is unlikely (MacArthur 2012).

Despite the lack of wood, there were signs in 2011 that the surviving structures are in a relatively good condition. The wooden fences and the few trees that once adorned the front garden of one residence indicate that deterioration has not occurred rapidly (figure 37). The dynamic periods during which the town was in the draw-down zone have been fast enough to provide some stability to the site, in that the water levels did not linger long enough that erosion and seiche action did not cause overt deterioration of wood. Evidence of the town's agricultural past lay scattered across St Thomas: fragments of old farming equipment, now rusted from years of submergence and exposure to the terrestrial elements are apparent in (figure 38).

In conclusion , it can be noted that the structures still present at St. Thomas are not significantly dissimilar from equivalent-aged, disused buildings elsewhere in the arid lands of the Western US, an issue further addressed in Chapter 6. Despite the varying rhythms of submergence and emergence, of waterlogging and drying out, the structural features still present at St. Thomas remain useful in interpreting its past, and St. Thomas remains resilient enough to allow tourism to take place thus far. However, the author believes that St. Thomas is a site of destabilizing in the long-term, should the water levels of Lake mead rise sufficiently to flood the town again. What is curious in the case of St. Thomas' future, is whether it will retain its position as s site of Mormon history and identity if it even again at a depth of -18m in Lake Mead... no policies or laws have been enacted to study this site in the long-term, or to protect it (or sites similar to it). St. Thomas now sits in the protected Lake Mead National Recreation Area, but if or when Lake Mead's levels again submerge it, will it again become a site devoid of particular archaeological interest<sup>67</sup>?

As an archaeological site, St. Thomas is different from the other case studies presented in this thesis. St. Thomas was a functioning town, prior to its submergence and more similar to the island communities on Ada Kaleh on the Danube prior to its submergence, than to undiscovered Bronze Age sites or Egyptian antiquities that are discussed in the other two studies. Unlike the Egyptian antiquities, it was not surveyed before submergence, since it was not considered of intrinsic archaeological value at that time (MacArthur 2012). And in contrast to the Bronze and other mixed-age sites in Scotland (or many other reservoirs around the world), most attempts at understanding this site have been through the lens of social history and social impact,

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<sup>67</sup> Hopefully, it will remain within the archaeological interest, but given the precedence to rescue or salvage archaeological features and then largely ignore other sites submerged in reservoirs, its legacy remains uncertain.

rather than through archaeological methodology<sup>68</sup> and site reconstruction or understanding. Archaeological consideration of St. Thomas is paramount to this discussion, however, and the many similarities and relationships between this town and other submerged cities or communities discussed in the analysis.

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<sup>68</sup> Although several historians have researched and written about St. Thomas, the town has never been excavated, saving the few test pits undertaken by Wyksup in 2006.

## 8C.1 Philae, Egypt (Lake Nasser, Aswan High Dam)

The expensive accomplishment of the raising of the Aswan High Dam to form Lake Nasser in the 1960's, was the second of Egypt's large scale, modern attempts at controlling the Nile River. Through its creation, large monuments of Ancient Egypt, such as the temples of Philae (figures 114 & 115), now relocated to the island of Agilika, became world-renowned attractions, generating much of Egypt's tourism income. The large dams, and the archaeological monuments moved and studied because of them, form the core of arguments for and against large, or 'mega', dams. The resources undertaken to remove and study the antiquities, the politics of those processes, the motivations of the parties involved, and the discussions surrounding the entire affair receive dialogue in this section. Throughout, this case study addresses the conditions of the archaeological resources within the Aswan Tailgate Reservoir, also known as the Lesser Lake Nasser basin, discussing key features from the flooded island, and how those sites were affected by the flooding events and what their current states suggest for their future.

Egyptian attempts at understanding river fluctuations, and diverting and flooding regions along Egypt's rich Nile Delta date as far back as 3500BC (Shaw 2000). Evidence from hieroglyphic writings suggest that these controlling mechanisms came under the same types of scrutiny, albeit on a less global level, as modern dams (Shaw 2000). Concerns about water cleanliness and availability, distribution and effects on populations, and the effects of raising and lowering water levels were all taken into consideration, despite the much smaller scale types of dams and flood control available as compared to those in the 20<sup>th</sup> century. At the dawn of

the 20<sup>th</sup> century, population pressures all along the Nile and the increased need for arable land led to the creation of the Aswan [low] dam: the first of two dams that will be discussed in this section. The Aswan Low Dam (ALD), as it is now known<sup>69</sup>, and the Aswan High Dam (AHD) have remained at the fore of discussion surrounding dams, reservoirs, and archaeological resources, for no other nation's monuments have received such sensationalism and foreign funding as those located in the geographic range now known as Lake Nasser.

## 8C.2 The Old Aswan Dam

Plans for erecting a dam at Aswan were drawn up within a decade of the British occupation of Egypt, beginning in 1882 (Chalmers 1902). British engineers set out drawing up plans for the new big dam at Aswan, calling for a progressive new Egypt and one that preferred “audacious engineering exploits” that would benefit Egyptian necessities, rather than “appeals to his vanity” (Penfield 1899: 1). The likelihood of the newly founded interest in Egyptian ‘progressivity’ was unlikely on the sole basis of an audacious exploit. Rather, because the Aswan and connecting valleys were, at the time, a rich location for the cultivation of sugarcane and cotton—both of which are described as being of better quality and a deserving of a more competitive market than crops from elsewhere in the world (Penfield 1899), this area seemed ideal for agricultural expansion. That expansion could not take place without the dramatic expansion of the historic irrigation systems.

There were other advantages to building a dam, and especially one at Aswan. For years, engineers Sir William Garstin and M. Wilcock spoke of the advantages of damming the Nile at Aswan. Aswan presented a variety of natural advantages, such

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<sup>69</sup> Initially named the “Aswan Dam”, until its predecessor took on that title.

as a bed of granite under the river, the conformation of the surrounding country, and the ‘inexhaustible supply of stone near by’ (Penfield 1899). Penfield points out that other dam locations were considered, due to the vigorous protests to the place at Aswan on the basis of archaeological monuments that would be drowned or damaged, but these were all discounted for reasons of security, inappropriate resting strata, and concerns for the longevity of other monuments (e.g. the temple at Kom-Ombos). To silence the critics of the plan for a dam, engineers proposed many plans to help safeguard the monuments, including one that included relocating the entire set of structures to a new location at that early stage. Long-term dam planning went ahead, with engineers compromising on the height of the dam with a final headwater allowance of 14 metres. On the heels of that engineering compromise, the decision for a large dam at Aswan received approval.

### **8C.3 The investigations at Philae, c. 1905**

Two examinations of the Temples at Philae were conducted before the erection of the Aswan Low Dam: the first examination occurring in 1895–1896, and the second in 1901 (Lyons 1908: 6). Early accounts of the original consolidation and conservation of the temples are discussed by Lyons in his 1908 edition. The original report “A Report on the Island and Temples of Philae” from 1896 are not available for consultation, leaving Lyons’ accounts the only available published description of the works undertaken. In the 1896 report, Lyons notes that to make the temples ready for their first series of inundations, the entire island underwent a period of ‘cleaning out’. Rubbish from the mud-brick buildings was removed, an examination of the foundations of the temples, colonnades and other ancient structures took place, and



plans were prepared of the buildings with some photography undertaken (Lyons 1908). In 1889, a topographical survey of the valley from Korosko to Aswan, i.e. the entire area that would be flooded wholly or partly by the reservoir, was made, with the final map ready for publishing in 1899 (Lyons 1908).

By 1901, the full particulars of the ground and depth and character of the foundations of the buildings were nearly completion. This was accomplished through the sinking of small, regular shafts, 1.3 metres by 1 metre, at the side of each building, to a depth of 13 metres (Lyons 1908). This examination allowed the investigators to determine, also, the depth at which the granite rock of the island was met by the building foundations, so as to understand the potential for subsidence once the water level was inundating the island and fluctuating annually. The investigators determined to experiment with the soils and sub-soils: a fine sandy mud, resting on a river sand mid-stratum, with underlying red granite bed rock, in good condition (Public Works Ministry Cairo, 1901–1902). Their experiments and further examinations were aimed at understanding the resistance of the silts to pressure from the buildings above, when the soils were at full saturation levels. Results from the experiment illustrated a need to unpin the temples of the entire island, which was undertaken with some haste, through the opening of large trenches; the foundations were bolstered through a series of installed layers of granite spalls, mortar, and boulder-sized stones left over from the earlier removal of rubbish from the island (Lyons 1908).

While ultimately, the Temples of Philae were relocated in during the Rescue Nubia Campaign from 1960-1972, the conservation works conducted on the temples from 1896–1901 are of some importance to this case study as they form the basis on

which Lyons, five years later, carried out his assessments of the then-flooded temples and foundations. In short, bolstering and underpinning efforts took two years to bring to completion, and in the case of all of the buildings of the temples, a considerable amount of Portland cement, long steel girders and old lintels were used to good effect. None of the temple foundations were rebuilt, and no foundation stone was repositioned; instead, the conservation teams concentrated on supporting the foundations, walls and columns as they were found (Lyons 1908: 6–17).

In 1908, Captain Lyons, of the Cairo Survey Department, investigated the Temples of Philae to determine how the five years of annual inundation fluctuations since the 1890's works were undertaken had affected the monuments. Lyons (1908) found the state of the temples "favourable", mimicking statements issued in the years preceding his investigations by the *Annales du Service des Antiquites de l'Egypte*, which interpreted the sites as both stable and in good overall condition, despite five years of flooding and drying periods. Contrary 'informal' findings were mentioned by Lyon (1908: 32) although references were not provided. His examinations concluded with six general problems, and an overarching solution to either raise the water level completely above the temples, or to relocate the temples to higher and dryer grounds. The problems are noted as:

1. A white band about 30 cm wide of dead and bleached algae at the high water mark.
2. A broader grey belt about 3-3.5 metres wide, also due to algae but below the white band.
3. Dampness just above the high water mark.

4. White saline efflorescence accompanying the dampness.
5. Brown and purplish-black patches of iron and manganese oxides respectively in places within the black zone.
6. A black line caused by coal dust and at present neither very marked nor very widely phenomena.

The salts that caused an ‘unsightly efflorescence’ seem to have become a matter of nonexistence, as Lyons noted that by the end of the five years, the salts, consisting of chlorides, sulphates, and nitrates, had completely washed away; leaving only some small amount of efflorescence above the highest level of the water. The algae growth that occurred in bands 30 centimeters thick and below the high water mark were left by dead algae. The practice from 1902–1908 had been to remove those bands of dead algae each season when the water levels retreated. This was accomplished annually by scrubbing with brushes, though Lyons remarks that this may have removed loosened sand grains from the face of the stone that may have been loosened by the earlier crystallization of the salts. No mention of settlement of any of the walls or foundations is mentioned, though Lyons mentions two instances of a slight opening of pavement joints.

Lyons determined that while numbers three and four were the only two visually damaging effects, and that all six “problems” could be solved by either moving the temples out of the water’s reach, or by raising the level of the reservoir so that both the high water and low water marks were well above the height of the monuments (Lyons 1908, 29). As before mentioned, there is no evidence to the

contrary that would suggest that the Temples were, in fact, at risk of damage. Lyons remarks,

“The favourable reports have probably reached but a small number of readers, but on the other hand statements have been made to the effect that the stone employed in the construction of the temples must inevitably soften in the water, and that it is already losing its power of resistance; such opinions have doubtless been advanced by those who have not had all the facts before them, for it is difficult to see what valid evidence supported this conjecture, many facts being directly opposed to it. All the stone in foundations, whether permanently or periodically wetted by the flood was found to be perfectly sound... and show no deterioration. There is, therefore, good reason for believing that submersion itself does no harm to the stone where the latter has been unaffected by accumulations of salts... rather, even where it has been so affected submersion rids the stone of the damaging salts” (Lyons 1908: 17).

These conclusions directly support the thesis presented by this project: that reservoir submergence can help to preserve some types of sites. Further study by the Egypt Exploration Society in cooperation with UNESCO, the United Arab Republic, the Antiquities Department of Egypt, and the government of the Netherlands (1962) found the Temples to still be in good condition, save those banded and discoloured areas Lyons pointed out decades earlier. Ultimately, the decision was made to relocate the Temples, for with the rising of the Aswan High Dam, the high water mark would be lower than it previously had been, placing it consistently half-way up the buildings, with a daily fluctuation of up to 6 metres. Had the reservoir water levels been engineered to remain higher than the monuments, Turnbaugh (1978),

Lyons (1908) and Smith (1962) concur that the site would have remained in better long-term condition—and with its original base, location and contexts undisturbed.

### **8C.4 The Aswan High Dam: 1958–present**

The Aswan High Dam project prompted a range of heated controversy over its feasibility and how the creation of Lake Nasser would inevitably require a plan of action from archaeologists and funding bodies from around the world, if some of the affected monuments were to be documented or preserved. Putting aside concerns about the archaeology aside momentarily, one notes that until the construction of the High Dam and particularly in the two decades leading up to the decision, the rate of growth of agricultural production and agricultural resources failed to meet the demands of a population that increased three-fold. The limited water supply in the country<sup>70</sup> and the small cultivatable area of land relative to the total area of the country caused the Egyptian government to make all attempts at reclaiming land and increasing agricultural production in the Nile Delta area, but to little effect. Ultimately, the government was forced to take into consideration a plan hatched some years early in 1947, by Greek agricultural engineer, Andre Daminos. Daminos, living and working in Egypt, proposed the construction of a big dam that could provide long-term storage of Nile water. The Egyptian authorities did not initially respond favorably. However, after the emergence of Nasser’s regime in the 1950’s, a hydrological committee was formed to study the feasibility of such a project and in 1954, the first design of the project was drawn by the German firm “Hochtief” (Shibl 1971).

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<sup>70</sup> Precipitation is limited to less than 80mm per year (World Bank 2011)

Following the Egyptian Government's appraisal of the benefits of the High Dam, it approached the International Bank for Reconstruction and Development (IBRD) for partial financing to cover the cost of machinery and equipment, although at this point, no mention of archaeological survey or the potential of moving monuments had begun (Shibl 1971). The independent benefit analysis undertaken by the IBRD showed the project as having great promise, although Egypt was required to meet certain terms and conditions of the advanced loan she required. Within days of notice of the advance loan's approval and the offer of extended assistance and pledged donation and support by the governments of Great Britain and the United States, the United States rescinded its offer of support- followed the next day by the UK. Contemporary observers of that action cited Egypt's policy of non-alignment and her recognition of Communist China as the key components of the joint retraction. Thus, when Egypt's arms deal in Czechoslovakia and Yugoslavia was a success, followed by the nationalization of the Suez Canal, the IBRD meekly withdrew its support on the grounds that its early report had been faultily compiled (Fahim 1981). The project became a victim of the Cold War, finally securing funding through a loan from the Soviet Union.

The outstanding effects of the dam, due to its extension beyond the Egyptian-Sudanese border, included the displacement of the entire population of the Wadi Halfa District. Lingering concerns during the early 1970's about the dam and the socio-economic impact on individual demographics of society led to an array of controversial facts presented to the Egyptian Government and laid out on the world stage. Controversy was particularly aggravated in the conflicts between facts and fiction, science and politics, and in the domestic and international circles (Fahim

1981). The “dam dilemma” continued and remains a contentious issue in all of the circles mentioned, with different stakeholders claiming very divergent benefits and costs associated with the dam, in hindsight. These more general opinions are laid aside in this section, toward a more scientific and holistic understanding of how decisions made regarding the dam have lingeringly affected the ancient monuments of the region.

### **8C.5 The International Rescue Nubia Campaign**

That the International Rescue Campaign to Save the Monuments of Nubia (1960–1972) ever came to fruition, given the charged series of circumstances in the Middle East, was due almost solely to the efforts of UNESCO. UNESCO’s consistent emphasis on “the necessity of such intergovernmental organizations dedicated to furthering peace and security and operating, with all its shortcomings, as a multilateral agency” (Hassan 76) only serves to further underline its importance in the rescue efforts. The Rescue Campaign was formed with the aim of salvaging archaeological sites threatened by the construction of the Aswan High Dam. It represented the first collaborative, international effort of its kind, and spearheaded the valorization of “World Heritage”, with the establishment of a UNESCO World Heritage Centre. Unprecedented in scope, magnitude and the level of international cooperation, it planned to not only safeguard archaeological sites but also attempt to relocate them.

UNESCO’s role in Egypt began before tensions climaxed over the Suez Canal and well before the Rescue Campaign launched, which is part of the reason why the Egyptian authorities took kindly to the advice and support from what they

saw as a non-partisan, inherently neutral, international and intergovernmental body. In 1954, UNESCO supported the establishment of “The Documentation and Study Centre for the History of Art and Civilization of Ancient Egypt” in Cairo. As tensions grew up around the Suez Canal crisis and talks of a large dam at Aswan commenced among Egyptian authorities, the General Conference of UNESCO in Montevideo began discussing how best to proceed vis-à-vis potentially lost archaeological monuments of some worth and of interest to both scholars and tourists. In response, efforts from the Cairo Centre began concentrating on collecting as much photographic and photogrammetric evidence as possible. When Egypt officially requested the assistance of UNESCO, within 24 hours the Director-General of UNESCO, Vittorino Veronese, responded with the following points:

- 1 It is not easy to choose between heritage and the present well-being of people.
- 2 Treasures of unrivalled value are entitled to universal protection.
- 3 The rescue operations will not just preserve something which may otherwise be lost but will, in addition, bring to light to as yet undiscovered wealth for the benefit for all.
- 4 The monuments can only be saved by the participation of governments, institutions, public and private foundations and people of good will everywhere. (Säve-Söderberg 1987: 76–77)
- 5 This undertaking will equate to “a task without parallel in history”, emphasizing the need for services, equipment and money.<sup>71</sup> (Säve-

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<sup>71</sup> Hassan writes that “What [Veronese] anticipated was truly prophetic: not only were the monuments saved, but much more was learned about the civilizations of Nubia and its peoples and cultures from archaeological sites that were not initially included in the call for action. Moreover, the



Söderberg 1987: 76–77)

Thanks to UNESCO, institutions from many countries were able to get involved in the rescue efforts, but sadly, international expeditions demanded 50% of the finds for their own, home museums in return for their efforts. This practice not only robbed Egypt and the Sudan of valuable heritage items, including whole Nubian temples, but also led to the partition of collections, undermining the integrity of assemblages now scattered in museums all over the world (Hassan 2007). Alternative compensations could have been for study loans, international exhibitions with the intent of raising funds for the salvaging of other monuments<sup>72</sup>, and toward better capacity building.

## 8C.6 Archaeological Investigations and Works

Despite the diversity of sites throughout the new Lake Nasser flood basin and the monuments within what would soon be the Aswan Tailgate Reservoir, not all of the monuments underwent a safeguarding process. The more notable rescue operations involved the works that took place at Philae involving the temple complex earlier investigated by Lyons, but many other sites and types of archaeological features from that very island remained *in situ*. These resources are now at the bottom of Lake Nasser and the Tailgate reservoir, and range in type from rock

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campaign has led to decades of archeological activity everywhere in Egypt that have radically revolutionized our knowledge of Egyptian civilization, including the remarkable rewriting of the prehistory of the Nile Valley by the Combined Prehistoric Expedition, led by Fred Wendorf, whose work within the Nubia campaign opened a new chapter in Egyptian archaeology” (Hassan, 2007, 80). On a worldwide scale, what Veronese called “a task without parallel in history” led to the launch of numerous operations supported by UNESCO to save world cultural heritage.

<sup>72</sup> More monuments were threatened in the aftermath of the dam from shifts in flooded groundwater sources close to the surface, causing movement in the foundations of many temples along the Nile Valley.

paintings and carvings, to carved edifices to still-unknown Pharaohs and early Christian burials. Some of those sites are described in the preliminary report of the Egypt Exploration Society's "Nubian Survey" in 1962, and entail some good detail of their conditions pre-inundation. Due to emphasis of the Egyptian Government's, and all of the State actors involved in *UNESCO's International Campaign to Save the Monuments of Nubia*, on only safeguarding those monuments with the greatest potential draw of tourism, i.e. providing Egypt and contributing States with revenue, these sites deemed of lesser importance remain submerged. It is possible to address this issue of those features in the Chapter 6 (application of data to uninvestigated sites), to determine to what extent these features are affected in the present, how they are likely to change in the future, and to what extent current hydro plans across several nations emphasize archaeological studies that bear revenue potential.

## 8C.7 The Temples at Philae

From the outset of the talks that began in 1959 between the Egyptian and Nubian governments over the erection of a large, secondary dam at Aswan and how to approach UNESCO for assistance in safeguarding select monuments, Philae was among the top priorities. While a decision regarding how to proceed with safeguarding the monument<sup>73</sup>, the initial step was to reassess the condition of the temples to determine to what extent the past 60-years of water fluctuations had altered the temples' strength and foundations, which had earlier undergone stabilization through underpinning (Lyons 1906). The government of Netherlands was called upon to conduct this research, and in 1960 concluded its investigations.

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<sup>73</sup> i.e. Whether to create a coffer dam around the monument and leave it in place, or to begin the task of reconstructing it elsewhere

Voûte (1962) described the processes to which the temples were exposed, citing that although the sandstone used to construct the buildings were subject to the effects of a capillary fringe attack: the buildup of easily soluble salts that are concentrated on or near the surface of the stone, leading to a destructive effect as the soluble materials then evaporate. These effects are most damaging to granite, but are less damaging to sandstone. Voûte (1962: 670) comments that, “Fortunately, the Nubian sandstones used for the construction of the Philae temples, composed of quartz grains with a ferruginous cement, are not very vulnerable to chemical weathering and decay. But the capillary action nevertheless has some effect on the sandstone also.” The researchers therefore concluded that the monuments should undergo relocation, and that the water level in the new lake had to remain below such limits as to prevent capillary attracted groundwater to reach the floor of the lowermost situated temple (Voûte 1962).

However, not all news of the sandstone’s long-term endurance of the periods of submergence was negative. In addition to the findings indicating the monument would fair best in its future through relocations, Voûte also asserts that as far as the monument’s past was concerned, its submergence had likely preserved it exceedingly well. A study of the photographs from 1905 through 1935 shows an appreciable decrease in the width of the capillary fringe, from 1.53m to 1.2m (Voûte 1962). He goes on to suggest why:

“...before 1905, when the lake only just inundated the island, its topsoil and the basal parts of the temple walls contained much sodium chloride, sodium sulphate, and some potassium nitrate and sodium carbonate due to centuries of inhabitation of the island. Consequently, after a short time a considerable capillary fringe had developed, containing hygroscopic salts. The crystallise [sp inc] on very hot and dry days, but become

again liquid during wet and cold nights, and serve as bases for further secondary capillary columns... However, since then the island of Philae and its temples have undergone a period of complete immersion and partial emersion every year, resulting in a process of washing and leaching of the hygroscopic salts and only the normal salts dissolved in the water of the Nile being present, the capillary fringe in the sandstones does not show any more a secondary extension. Moreover, the amount of damage done by this capillary fringe, has diminished with the leaching of the stones. Therefore as far as conservation of the building stones is concerned, the geologists' study has pointed out that the regular complete immersion of the temples during a period of several decades has had a favourable effect for their future preservation.” (Voûte 1962: 672)

What Voûte describes strikes a resonance with the conclusions of the case studies at Lake Mead and in Scotland.

In the summer months of 1968, the Egyptian Government made the firm decision to dismantle the temples on Philae and re-erect them on the neighbouring island of Agilika, which stood 15 metres higher than Philae Island. Due to the completion of the Aswan High Dam in 1969, engineers erected a cofferdam around the island of Philae to protect the island and its workers from raising water levels. Actual works to dismantle the monuments began in 1972, as workmen simultaneously prepared the island of Agilika for receipt of the monuments; leveling and widening the island, before landscaping it to make it look as similar to Philae as possible. The dismantling and reconstruction phase lasted until 1979, making the works the second longest campaigns of monument relocation, behind Abu Simbel. Stones of the temple were carefully dismantled and numbered before transportation to Agilika.

## 8C.8 Effects on relocated structures

Attempted in-person study of the structures at Philae took place in the summer of 2012 to add personal photographic evidence of structure, any damages and context to this dissertation. However, the unrest brought about the “Arab Spring” followed by the 2013 deposition of President Morsi, made such a visit impossible, given the strong discouragement of the UK and American governments at the time of this writing. There are currently no subsequent studies of these sites for referral and Kockelman (2012) addresses the dire need for both a general monograph on the island of Philae and further research into those remaining sites (now submerged). No research attempting to understand how these sites’ new locations have affected them is currently available. Only applause and congratulatory accounts are among the annals of Egyptology and heritage management, complimenting the exemplary works undertaken based on the magnitude of works attempted. That the efforts enacted along the Nile to save these monuments were exemplary is not disputed here. Works carried out to the highest standard and in front of the entire international stage are not the question of this examination, especially as teams of workers faced complications of sudden flooding of the original cofferdam, a need to deploy Egyptian Navy divers to draw and photograph monuments before dismantling, and difficult sources of funding. Despite those exemplary works, the nature of the entire project and its lingering effects on now-submerged archaeological features and the reasons behind those submergences remain unaddressed. How the relocation has changed the sites, their context and to what extent they are, in fact, “exact” replicas of their former glory is of question, as well as if they *could* have endured inundation for the several hundred year span that

Lake Nasser poses. Is it possible that these sites would have retained something of their structure and heritage “value” had they remained *in situ*, rather than relocated for the sake of tourist income? The dialogue that follows utilizes photographic evidence, the earlier considerations of site stability, the use of first hand accounts of these monuments and those left *in situ*, and satellite imagery of the sites to consider these aspects.

The temple complex at Philae represents a series of complications in attempting to discern the degree of damage sustained through the actions undertaken due to the formation of Lake Nasser. On the one hand, their relocation has ‘saved’ them from Lake Nasser (although whether the lake would have destroyed the monuments is still a dubious point) and allowed visitors from around the world to view them up close. Likewise have scholars undoubtedly benefited from visiting these monuments, and so too have the now three different governmental regimes reaped revenues from them. Additionally, opportunities inherent in relocating the Temple structure on Philae to Agilika Island: the entire effort provided Egyptologists a chance to better understand construction methods, thereby creating a unique chance at experimental Egyptian archaeology. Bizarrely, post-relocation studies about the enduring nature of these sites do not exist, just as post-inundation studies on the effects of Lake Nasser on monuments newly submerged lack fruition.

The discussion of the effects of inundation on Philae are therefore threefold: there are those effects that directly impacted the monuments; the direct effects of inundation on the now submerged island; and the effects on those structures that were not relocated to Agilika. For the 11 different monuments that make up the temple complex on Philae that were relocated, the issues channel into not only how

the waters could have affected them, but also how that relocation has affected their context in the wider archaeological landscape and if any differences in their reconstruction (versus pre-dismantled state) exist. Among the biggest problems facing above ground heritage in Egypt, tackled by a host of institutions including UNESCO, the Getty Conservation Institute and the Polish Centre for Archaeology, are the related issues of increased population (including tourism) and air pollution. The rising population was partially responsible for the decision to create the Aswan High Dam, which in turn created Lake Nasser. This had the consequential effect of increasing the levels of humidity in the area, an affect exacerbated by the number of tourists in and around monuments, which in itself increases humidity rates by several percentages. The increase in humidity wreaks havoc on limestone and sandstone monuments.

However, there is also the effect of the increased levels of groundwater on built heritage. Nearly 80% of Aswan's incoming water supply leaks into the ground, a condition also observed and reported on in Cairo, and as the groundwater rises, it dissolves mineral salts from the soil and bedrocks, resulting in weakened bedrock foundations. It also results in the seepage of salt crystals into monuments, culminating in the white lesions encountered and described by Lyons in 1906. However, unlike the monuments at Philae, which were subject to regular submersions that removed the damaging salts, the un-submerged monuments never have a chance for these salts to leech out into the water, putting them in a permanent state of over-crystallization. Air pollution adds to this fray of destabilized monumentality, as clouds of exhaust turn corrosive when dissolved by rain and the increased moisture content in the air. The effects of these combined destabilizers

have not received commentary at the Philae temple complex, but they receive citation as solely responsible for the breakage of a 250kg chunk of stone from the Sphinx at Giza (Hawass 1993; for further reading about destabilisers of above ground monuments in Egypt, see Gauri & Bandyopadhyay 1999; El-Baz 1992; Verdel & Chambon 1994; and Hawass 1993).

Since there was substantial evidence provided by both Lyons and Voûte that the monuments were stable and likely to sustain very little permanent damage by the flooding of Lake Nasser (despite this submergence lasting several generations), one can only assert that their relocation has provided opportunity to incur greater and longer-term damage. When placed into the context of the monuments' relationship with the island, one observes that although the buildings were reconstructed to very good likenesses of the originals, their setting on Agilika is not identical, thereby almost entirely disregarding any issues surrounding landscape archaeology (image 6.3i). That none of the mud brick structures (houses, workshops or common workshop areas) were relocated, despite the comparatively low cost of having done so, only further removes the monuments from their historic and archaeological setting, rendering the entire complex at Philae of tourist, rather than any intrinsic historic or archaeological value, even if the complex remains aesthetically pleasing. The lack of scrutiny, survey or attempted relocation of the early Coptic graveyard on Philae or the Coptic churches, serves as evidence of a country that has, in living and historic memory, oppressed the rights of the small Coptic population living in Egypt. It is a country that has ignored the cultural identity of one group, prioritizing the built heritage of a non-existent, but nationalistic and idealized past that would continue to drive tourist activity to the area. This behavior continues today, as demonstrated by



the continued violence against the Coptic Christians, amidst Morsi uprisings, in Egypt. Whether the *in situ* destruction of these structures and cultural places on Philae was intentional, we may never know, but closer observation of the island as it is today suggests that any cultural, educational or archaeological context contained in those places may indeed be lost. Huge sections of the island are at risk of completely washing away. The potential for deeper subsoil context and understanding may yet be possible, although there is no current research or monitoring plan in place for this submerged landscape.

### 8C.9 Discussion

Remarkably, despite survey and studies on the other monuments located on Philae (excluding the temple complex) and notions that they would inevitably be destroyed by the long-term inundation brought about by Lake Nasser, none of them were fully recorded or considered for relocation. This is puzzling, for although archaeology is the study of the past and therefore the pursuit of materials capable of providing educational merit (not to be confused with value), these information rich features were not deemed worthy of saving at the time of the High Dam's creation. Instead, the safeguarding of a large and admittedly aesthetically pleasing monument was given the honour of relocation –at great expense to all nations involved- while smaller, less expensive to relocate features were left to inundation. Further, the long term effects of inundation on monuments in the adjacent grounds to Lake Nasser are under relatively constant scrutiny due to changes in the local water table, which is undermining their stability thanks to shifts in ground levels, foundations and chemical balances in those soils. This is not to argue that the decision to move the

Temples at Philae was inherently unnecessary; the Temples are astonishing works of ancient architecture. Relocating those temples on the basis of potential tourist revenue transcends the intentions and ethics of archaeology as a discipline, particularly when paired with the submergence of more educationally meritorious features both on the island and in close proximity that were simply ignored. That this is lodged, historically, in an era of emphasis on large and flamboyant structures in an age when tourists would flock to Egypt for the sake of walking the corridors of ancient Pharaohs, rather than relatively less stunning graves of early Christians and the mud brick workshops and huts of those workers who built the Temples, is taken into account.

There is no judgment or perfect hindsight notion that efforts within the Save Nubia Campaign were inherently wrong or flawed. However, that this practice of sheltering and safeguarding those monuments most likely to generate income, and not for the sake of so-called archaeological “value” or interest, is a trend seen across nationalities both in the 1960’s, straight through to the present. Further, the claims that Philae and its temples were “recreated” on Agilika are spurious, given the island’s other prominent structures and archaeological well of information were not recreated. Workers on reshaped and landscaped the areas on Agilika around the temples in such a manner as to make it similar to Philae’s overall aesthetic. Such claims or actions would likely prompt tirade and derision from landscape archaeologists and heritage managers in today’s atmosphere (keeping in mind that this was not the milieu apparent at the time of relocation, landscaping and inundation), keen to preserve the actual landscape, graves and settings of less-than noble factions of society.

Lowenthal (1989) recognizes the modern inclination toward saving or preserving everything deemed “from the past”, whether in an effort to create or preserve identities (nationally, locally or ethnically) or as a symptom of commodification of the past, itself a symptom of overvaluation and consumerism of material goods. Therefore, if archaeology must engage in the concerted preservation of the past, let it be a more selective one, in which items and buildings of pure aesthetic are not those preserved for the sake of income. Rather, let archaeology progress out of this stage of childish commodification of that which glitters and is not gold. Let it come back to what the discipline *is*: the study of the material past; not just the conservation of a romanticized and aesthetically pleasing past. However, this will only happen when legal modifications commence that allow and encourage the discipline to preserve to an extent and monitor that which does not require relocation.

*"The serious erosion of our heritage in ploughed fields, reservoirs and forests must surely be considered in a national strategy for its protection either by record or by other mitigation."*

–Tam Ward

## **CHAPTER 9: ANALYSIS**

Up to this point, substantive chapters have provided the case studies and dialogue of relevant policies that form the backbone of this dissertation. This chapter focuses on bringing the results of those three case studies together by assessing which archaeological features, and in what context, are the most vulnerable and what means exist to monitor, conserve and protect them. Discussion of case study results is then paired with the concluding analysis of each country's heritage legislation, and poses means through which the physical monitoring and conservation schemes can be implemented.

Some types of archaeological feature are more vulnerable to redistribution or damage than others, and these vulnerable types of features tend to be situated in the draw-down zone of reservoirs, and composed of very lightweight materials. The case studies presented provided evidence of this and that evidence is correlated and presented here.

### **9.1 Case study fieldwork (Scotland)**

The twenty unique features that were investigated in the reservoirs of Scotland were broken down into typologies based on their construction material (since age was the ambiguous modifier for many of the features, it was decided

against). Those features were broken down into the categories of: stone, brick, natural, and manmade. The categories were further broken down into subcategories, on the basis of the condition of the material when the reservoir was flooded (i.e. knocked down or left standing), as this indication was considered important in determining how and to what extent flooding might affect the site. Categories were also kept relevant to the features investigated, and so there are categories that may exist in relation to features in other reservoirs or countries, but which are not used here. Subcategories are as follows:

- Stone A: (Standing when reservoir created/not knocked down)
- Stone B: (Fixed together; Intentionally knocked down)
- Stone C (Natural, not affixed; not knocked down)
- Brick A (knocked down)
- Brick B (not knocked down)
- Earthen Remains A: (Built up)
- Earthen Remains B: (pits and nondescript features)
- Man made (Iron, metal, or other industrially produced conglomerate)

Each individual feature was recorded while in-water on a questionnaire, which asked the same questions, regardless of typology (assigned post-fieldwork). Construction material, construction method, depth in reservoir, proximity to dam, proximity to key channels, site redistribution, erosion, floral growth, and temperature variation were included. In cases where divers did not know the answer to specific questions, the team assembled in evenings to review online information from the RCAHMS and the British Geological Survey. All observational information was noted while in-water, and cross-referenced with that diver's dive-buddy, who was

also responsible for filling out a duplicate questionnaire. This method ensured a more accurate representation for better precision in what were occasionally objective observations. A digital copy of the results of those correlated forms is viewable as a spreadsheet in Appendix entry 6a. Score totals of this template question form was 54, a number achieved through the categorization of answers within certain margins, each categorization scoring possible numbers between zero and six. For example, proximity to the dam was measured in increments of 250m, with feature location noted as closer to the dam being lower and features further from dam being higher. The higher the number in each section, the more damage (or more erosion, redistribution, etc. of that specific question) or more likely damage was to occur. Therefore, features with higher overall scores (those reaching numbers closer to 54) were the features that were the most vulnerable to future damage, or which had sustained the greatest negative impact of the reservoir to date. This method of scoring is based on the data collection methodology utilized in the "Coastal Zone Assessment Survey: Firth of Clyde and Isle of Bute" study on behalf of the SCAPE Trust, Firth of Clyde Forum, and Historic Scotland (2004).

The charts used to visually juxtapose numeric information are formed on the basis of the standard scatter plot chart, with x- and y-axis. The placement of each plotted feature (unlabeled except for standardized typology labeling) is not on the basis of the feature's actual depth in the water, e.g. if a plot juxtaposed depth (x-axis) against damage (y-axis), a feature that appeared where  $x=4$  and  $y=6$  does not correlate to 4 meters in depth. Instead, the coordinates on both axes correspond to damage ratings between 0-6. In the example's case, 4 (depth) = 4-6 meters depth. Each numeric score is standardized and viewable in Appendix entry 6A. Each

typology bears its own colour and shape coding. Features in the stone typology (all) are represented by orange squares. Pink circles represent brick features. Natural, or earthen, features are blue diamonds. Manmade features are represented by green triangles. Occasionally, one feature's shape demarcation is larger than other typologies surrounding it. This occurs when more than one feature sits at the same x-y convergence, so that both typologies can be visually viewed on the chart.

#### Typologies, depth and damage assessment

To begin the analysis of these features and their typologies, the first task was to assess to what extent features were affected by their creation material (i.e. which typology they were categorized as) in relation to their depth of the water. This was accomplished through plotting the features on a scatter chart (figure 115), where the x-axis represents the features' depths in the water and the y-axis represents that features' overall damage score. As notable in figure 115, the natural features are grouped in a loose cluster at a shallow depth in the reservoir, but at the highest damage rating of all the typologies. There are no outliers to this trend. Stone features hang loosely clustered only a short way down the chart, but with two outliers where  $x=20$  and where  $x$  meets  $y$ . This indicates that stone features are still generally vulnerable to damage when they are in the draw-down zone. The brick typology is also loosely centered in the chart, with one outlier where  $x=12$ . Yet again, brick typologies are most vulnerable when in the draw-down zone, but less so when in deeper water. The visual pattern suggested by this chart indicates that natural, or earthen, features are the most vulnerable of all of the typologies, although even more so when they are situated in shallow water. Stone and brick features are somewhat more durable, with neither typology scoring as highly or consistently as the natural

typology. Therefore, if resources aimed at conserving or excavating archaeological features were limited<sup>74</sup> (e.g. time, budget or labour force) the natural typologies should be the priority of archaeologists and legislators. This typology represents heritage at "greatest risk", as they would bear the least resistance to the forces of the reservoir and inundation, making them the priority for recording or excavation. *In situ* preservation may work if sandbags or other topsoil reinforcing works were implemented to diminish the effects of erosion from wave action.

Due to small variances in scores for each typology's answer sheets, the author deemed it unfruitful to chart the typologies against every scored question asked on the in-water questionnaire. However, typologies are plotted on a scatter chart with x and y data for total damage score against erosion, floral growth and visible site redistribution. It is already established from the data evaluated above, and evidence presented earlier in this dissertation that location in the draw-down zone is the most damaging, and further evidence of this is presented below. It is therefore also relevant and useful to determine which other factors are most pivotal in determining total potential damage, if there is a correlation between these factors, and to help ascertain what the best methods of monitoring and conservation are in the future (for both sites already submerged and sites yet to be submerged).

#### Damage and Erosion

It was uncertain from the outset whether there would appear a direct visual correlation between degree of erosion and damage score. The author considered it possible that the role of erosion may have been over estimated, and that other factors were more important in determining a feature's durability. Erosion and damage score

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<sup>74</sup> Although in practice, these aspects are almost always limited.



were plotted on one scatter chart that contained all of the typologies (figure 118). It is evident from the visual information presented that once again natural features are the most vulnerable to the effects of erosion in reservoirs. This vulnerability is followed in sequence with both stone and brick, suffering erosion to some extent. When erosion is paired with depth information (figure 117), another trend becomes apparent: the shallower a feature, the more likely it is to suffer damage. Natural, or earthen, features again suffer the greatest damage in the 4-6 depth demarcation, which in real terms indicates location in the draw-down zone of the reservoir. The natural features are clustered, and score the highest for evidence of erosion. Stone features fair slightly better, with only half of the stone features bearing evidence of erosion, regardless of depth. Brick features, too, are not impervious to erosion, but show less evidence of it, even when in the draw-down zone. Erosion, based on this evidence, plays an integral role in a feature's overall damage, and rates of erosion are correlated predominantly to location: draw-down zone fluctuations are the primary causes of erosion. It is likely that the effects of erosion on deeper features correlate to initial fill period of the reservoir, as discussed earlier.

#### Floral Growth

The issue of floral growth on features is one that the author considered important in two ways: on the one hand, the growth presented a positive attribute in that it helped keep the forces of erosion to minimal levels. Conversely, it presented a problem, since a feature became indistinct due to that same floral growth and may be un-located by archaeologists interested in understanding it. In demarcating rates of floral growth on features, the diver questionnaire gave higher scores to features with greater growth, since it was in the interest of the fieldwork to survey and record as

many distinct features as possible, and that growth was an obstacle to that goal. However, upon greater consideration since the fieldwork, it seems reasonable that although some features were difficult to survey because of the growth, it was that growth that had perhaps allowed the feature to survive. Not in all cases does floral growth inhibit erosion and protect submerged resources<sup>75</sup>, though in this case floral growth seems to have protected features. Figure 119 displays the total scores of floral growth rates of each typology. The stone typology features prominently with a total scoring of 10, with natural features scoring a close 9. Brick comes in at 6, and the manmade feature does not appear at all because it scored a total of 0. That the stone typology scored so high lends potential that the algal growth (unidentified) apparent on the structures may have provided some protection from the abrasive effects of suspended particulate in the reservoirs' currents. What must be taken into account however is that if taken on mathematical average, each stone feature (7 of which in total), would have scored a low 1.4 rating on the dive questionnaire: small to large amount of algal growth. The natural typology (totaling 6 distinct features) averages out to a scoring of 1.5 per feature: small to large amount of algal growth. Brick is therefore averaged to 1.2 per feature: small to large amount of algal growth. There appears on 120 a negative correlation between floral growth and damage score; the higher the damage score, the lower the growth. However, the inconclusiveness of floral growth's link to preservation or destruction remains. It is possible that the a moderate amount of algal growth helps to deter the worst effects

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<sup>75</sup> As discussed, the overgrowth of Tamarisk throughout the town of St. Thomas posed a real problem to the stability of the structures. In that case, the growth was occurring in the post-emergence phase, and in that specific case, Tamarisk roots were undermining stability and making long term terrestrial preservation difficult. However, the Tamarisk may in the long term provide some protection to the town, should the levels of Lake Mead rise again. It would serve to protect features, at least temporarily, by slowing the rate of refill and preventing some of the refill fluctuation erosion.

of erosion and abrasion, while not being sufficiently deep or intrusive enough in its root systems to create floral turbation or structural instability. On this basis, there is only a correlative link between floral growth and damage (prevention or enhancement) rather than causation.

### Site Redistribution

Site distribution is the final aspect of the fieldwork that was charted. Understanding its relationship with total damage score and depth in the reservoir will help to mitigate damage in the future. Site distribution refers to the amount of scattering or movement of the feature's principle components (building materials) or associated artefacts. Figure 121 displays this data, where  $x$ = total damage score and  $y$ = site redistribution. In this case, a positive correlation exists between degree of redistribution and total damage score, although it is unclear whether redistribution is the primary factor leading to heightened levels of vulnerability. The final chart presented, figure 122, displays the data related to redistribution and depth in the reservoir. Clear from the visually displayed data, there is a strong and positive relationship between the depth of a feature and the degree to which it is redistributed. In the case of all of the plotted sites, the shallower the feature, the greater the damage to it, with earthen features displaying as the most vulnerable (most damaged) and stone and brick features maintaining the greatest degree of stability.

### Comparative Data Conclusions

This specific set of data confirms what has been hypothesized from the start of this dissertation: that not all sites are damaged when flooded by reservoirs. Features that sit deeper in the reservoir are protected from many of the damaging effects of the post-inundation fluctuations, succumbing primarily to the effects of

wave action during the filling phase and chemical alterations<sup>76</sup>. The features that sit in the draw-down zone are the most vulnerable, and although natural/earthen features are the most affected, in the long term, wave action that brings about abrasion, erosion and site redistribution, will negatively impact even stone features.

## 9.2 Analysis of data collected from St. Thomas (Lake Mead)

The information collected from the previously submerged site of St. Thomas in the Lake Mead flood basin, differed greatly from the data collected in the Scottish reservoirs. Investigation at St. Thomas consisted of a site visit, with photography and post-visit comparisons of site condition. Because St. Thomas had not undergone another period of submergence between the author's site visit and the data collected by Wyskup (2006), analysis of the mid-term effects of submergence is of little use. There was very little difference between the site's conditions between the visits. Discussion about the site, its long-term stability and what it will take to ensure its stability are still relevant.

The town of St. Thomas is not fit for habitation in its current condition, although foundations and passageways between buildings still exist. Foundations of buildings are deteriorated and not capable of bearing the weight of walls and ceilings. The adobe from which most of the buildings were originally walled and roofed has long since been eroded or abraded away. However, the purpose of this ghost town turned archaeological site is not to be judged on the basis of its reuse as a functional, populated town. The remains of the town act instead as evidence that it is still an area of archaeological value and place for potential study. St. Thomas,

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<sup>76</sup> Based on the data provided in Chapter 3.1, and not collected or displayed here.

submerged for 80 years in 18 meters of water, and having undergone several periods of drying and subsequent submergence is still a valid archaeological and historic site.

Although St. Thomas underwent repeated periods of drying and submergence, it was not a site that was located specifically in the draw-down zone. During the periods of regular rainfall (and not prolonged drought- the case at the moment), average yearly fluctuations in Lake Mead were 4-5 meters (Haley et al. 1989). St. Thomas was situated 18m below the surface, and was therefore protected during these yearly periods of fluctuation. This is further evidence that location in a reservoir is fundamental to the long-term prognosis of its stability and viability as cultural heritage both during its tenure as a submerged site and as a heritage site post-reservoir. St. Thomas represents a site that has endured submergence in a reservoir and surfaced as an area of archaeological and historic interest. It is part of the Lake Mead National Recreation Area, which has full protection of the NPS. The interest in St. Thomas stems from many disciplines: the Mormon community visits St. Thomas as a place of Mormon history (McArthur 2012), archaeologists visit and write about the site, and tourists come to the site as a part of a larger, regional protected area with its own unique landscape, wildlife and places of special historic interest.

St. Thomas is still under threat. The long-term stability of the town as an archaeological site is threatened by continued erosion on the site, the overgrowth of Tamarisk that threatens foundation stability and continued episodes of bioturbation, the potential of damage or vandalism from open-access tourism, and the unlikely but possible flooding of the site if the Colorado River's waters are ever at average levels again. Stabilizing St. Thomas is work best left to conservators and archaeologists

from the US NPS, but some methods maintaining a stabilization of the site are discussed here in the context of assuming the site will be submerged again.

#### Tamarisk

First, the overgrowth of Tamarisk may not present the long-term problem of site destabilization should the town undergo submergence again. The Tamarisk that is in place may serve as an erosion buffer from rising water levels, and slow the actual flow of the water. The slowing of the water will lead to a decrease in the strength, number and types of waves that may lead to assured site destabilization. Should the overgrowth of Tamarisk continue to break up the foundations of buildings, these areas of growth must be maintained or the rising waters are likely to do even more structural damage.

#### Vandalism

In order to manage potential vandalism from visitors, a manned tourist booth could be established at the start of the Lake Mead Recreational Area St. Thomas Trail. The presence of the NPS could deter visitors from potential vandalism or theft from the sprawling site.

#### Grounds

There is little that can be done to prevent the cracking of the ground and the hardening and compressing of its sediments when it is submerged. The best course of action is to ensure that structural remains are stable by preventing other factors from weakening them. Walls and foundation remains can be bolstered, if and where needed.

#### Conservation Measures

Should it be established that the levels of Lake Mead will again rise above the town, an array of mitigating measures can be taken to ensure St. Thomas is protected from as much damage as possible. Sand bags can be placed over particularly vulnerable areas of the town, helping to prevent erosion. The rate at which the lake fills can also be controlled, so that it is as slow as possible, thereby limited the effects of erosion and abrasion on upright structures. A slow fill rate will also limit the possibility of site redistribution. Site redistribution was not observed during the author's site visit, but the erosion of sediments has revealed a high quantity of archaeological material (nails, tiles, broken pottery and crockery, and pre-inundation domestic products, e.g. beer cans, tinned foods with labels intact, farming equipment). Should the fill rate be too fast, these materials will be redistributed around the site and surrounds of the town, and lose further context.

### **9.3 Analysis of data compiled regarding the Temples at Philae (Lake Nasser)**

The complex of temples at Philae represents a true accomplishment of engineering and cooperation between nations, although this accomplishment is tinged with the knowledge that the cooperation was on the basis of eurocentric and economic ambitions (Anderson 2011). The lessons learned at Aswan, were that relocation of large monuments is possible, and that these monuments attract tourists and help to support regional and national economies. The monuments stand as proud tokens of those accomplishments, and yet the rationale behind that relocation seems faulty, as does the fact that countless sites and features remain in both Lake Nasser and the Aswan Tailgate Reservoir that simply did not stand the chance of survival that the Philae temples stood. That the temples were relocated was on the basis of

romanticism about the temples, although that romanticism lacked the constitution to apply to the island itself and the other features on it, and tourist revenue for the Egyptians and the European collaborators, rather than relocation on the basis of science, stewardship and longevity of historic materials.

### Photographic Evidence

Photographic evidence<sup>77</sup> from pre-submergence by the Old Aswan Dam shows the temple in stable condition, but surrounded by nondescript rubble. The temples at that point were not maintained, and no restorative works had been commenced on them. Nevertheless, these photographs form an integral part of the comparisons with Lyon's works, as well as modern photography. Through photographic juxtaposition, one begins to understand the effect of inundation on these sites. Figures 123 and 124 are photographs taken by George Lewis in circa 1905, at about the time that the submergence and reappearance of the temples at Philae were considered a novelty. The pictures show the columns of the temple of Isis just showing a few meters above the water level. It was this water level and during this period of annual fluctuation that prefaced Vôte's (1962: 672) observation about capillary fringe appearance in bands around the columns of many of the temples at Philae. In that same instance, Vôte suggested that the structures were not likely to sustain any permanent damage, and that these appearances of fringe around the columns were generically aesthetic (1962: 672).

Figures 125 and 126 are of the surveys and subsequent plans commissioned for the work carried out by Lyons, and surveyor and engineer, Dr. J. Ball, in 1901

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<sup>77</sup> There are 63 unique images of the temple complex at Philae, pre-1903, available through the Washington University Digital Gateway (WUDG), and these images were zoomed in at high resolution using the WUDG online media software. Therefore, the presented images do not represent the full resolution of those available and that were manipulated through WUDG media centre.



and 1902. The plans also show the placement and structure of the underpinning works installed throughout the monuments during that time. At this point, little change in condition can be established between the photographic evidence from the mid-1800's and the plans produced by Ball in 1901 and 1902. Therefore, the next step in ascertaining long-term damage done to the monuments was to examine photographs taken in the 21st Century, and compare the range of those photographs to both the plans and pre-1900 images. The author tried to obtain copies of plans for the monuments from the engineering works in the 1960's, but these were not available. Modern photographic evidence was accumulated through GoogleEarth, which was chosen because of the range of photographs available, the less likelihood of the images being digitally altered (therefore producing more honest imagery), and because the images uploaded to GoogleEarth from ordinary users are produced by diverse photographers from different countries. There are fewer tendencies for Eurocentric photography in the snapshots.

Figure 127 displays Trajan's Kiosk, also known as the "Pharaoh's Bed". In this image, little evidence remains of the monument's submergence. All evidence of the capillary fringe has been removed. Its backdrop is different from that shown in earlier imagery, but the monument is itself whole and unaltered by the submergence. The Western Colonnades are displayed in figure 128, and bears little contrast, which is a photograph of the same scene (pre-relocation and inundation). The noticeable difference is the dark grey band that appears on several of the columns, from 0.1-1.5m up from the base. This discolouration is the result of the many periods of water level fluctuation (Vôte 1962). However, this discolouration is a merely the result of fluctuation, not to be confused with longer-term, full

submergence; nor should it be confused with damage to the structural integrity of the monument. Figure 129 displays the large inscription on the forecourt and front pylon of the Temple of Isis, depicting Ptolemy XII Neos Dionysos. There is little evidence of damage to this engraving compared to its pre-submergence state.

Given the relative stability and lack of damage to the relocated temples, the largest problems associated with Philae are not on the basis of the temple's structural stability<sup>78</sup>, but rather of Philae island's original landscape, that island which once housed it and a number of other sites, is now submerged and rapidly disintegrating: an orphaned island still housing the bodies of countless but submerged dead. The outline of Philae island can be seen on GoogleEarth (figure 130). It is likely that the temples themselves would have survived submergence with little damage. Their relocation meant the inevitable loss of other types of vulnerable archaeological and historic features. The remaining two Christian churches on the original island, the burial of a Bishop of Philae (circa 362 AD), and the mud-brick settlement remains on the northern, eastern and southeastern parts of the island are in an unknown condition (figure 131). Rates of siltation in Lake Nasser are considered 'serious' by Zeid (2001). It is therefore possible that the increase in deposited sediment provided adequate cover to protect the remaining structures on the original island. This stands in direct contradiction to the threat of flood-induced scour along the course of the Nile (Sloff, J & El-Desouky, I., 2006). Sloff and El-Desouky (2006) suggest priority areas where protective measures must be taken to prevent bank erosion, although none of these areas include places of archaeological interest. Nevertheless, the change in water output of the Nile will certainly continue to have an effect on those

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<sup>78</sup> Which is good, saving unknown weather patterns and the potential for terrestrial erosion or ground subsidence.

submerged structures and features in the Aswan Tailgate Reservoir. The conditions of them have not been fully assessed by divers or other on-location archaeological or conservation expert. There remains the larger problem of changes in ground water levels that is adversely affecting monuments and structures in the areas around Aswan (Benedick 1979; Zeid 1989). This specific conservation problem, however, is out-with the scope of this work.

## 9.4 Cross-cultural consistencies

What comes to the fore as a result of these analyses is a set of features that have been studied, largely only when reservoir waters have receded or they have been moved to dry ground. The previous studies in Scotland occurred when water levels were at periodic lows and terrestrial archaeologists could record and excavate. The studies conducted at St. Thomas were all done during the post-emergence phase. St. Thomas, as a submerged set of features and structures, seemed to warrant little attention, until it sensationally reappeared over a decade ago. The Philae temples were relocated to a new island, where they would remain high and dry, and interesting to tourists and academics. These examples drive the issue further that management of sites happen without alarm or complication when a feature is terrestrial- even when managers and governments went to great trouble and expense to move features. However, the management of reservoir-submerged features is not happening: not in the USA, not in the UK, and not in Egypt<sup>79</sup>. It is not happening *in situ*, which is when it should be happening. The failure to tackle this issue paints a striking contrast to the good management of underwater archaeological and historic

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<sup>79</sup> Long-term management does not include the isolated publications of the NPS National Reservoir Inundation Survey or the WCD Report.

sites in all of these countries, when the type of waterway is different. The USS Arizona, the ongoing works at Alexandria, and wreck of the Mary Rose highlight just few of the ongoing management practices for features or sites that were in salt water. Similar examples (e.g. the wreck of the Edmund Fitzgerald, and the number of investigated crannogs in Scotland) highlight the continued management and investigation of sites in freshwater... but not in reservoirs. With the massive body of publication and fifty years of a discipline, why are underwater archaeologists still reluctant to consider features in reservoirs? Is it because the features are structures, that there is limited understanding of submerged structures (i.e. buildings)? Are towns, building foundations, rock paintings and cemeteries (even Bronze Age ones) less interesting or meritorious than shipwrecks, Iron Age forts or palaces collapsed into the sea? Are they less romanticized in a Eurocentric pop-culture turned academic agenda? Or are reservoirs only now coming into the center of discussion, and beginning to warrant the study and consideration of which they are deserving?

There is a three-fold problem. First, submerged resources in reservoirs may endure submergence, though this should not necessarily bar them from being studied with the same scrutiny and interest as maritime or other inland waterway sites. Next, there is the remaining issue that the relocation and concern about features, as displayed in this dissertation, is generated on the basis of monumentality rather than actual preservation, and toward economic ends as occurs with the commodification of features and related artefacts. Finally, there is the persistent lack of domestic or international policy aimed at addressing not only the future of inundated sites, in a holistic way, but also the retrospective concerns about an already submerged past and our collective desire to conserve it.

## 9.5 Factors contributing to long-term functionality and long-term site monitoring

There are a host of factors that contribute to long-term stability of a submerged feature, its long-term functionality as an active site, and whether or not a site is monitored. The most important physical issues surrounding stability of a submerged feature rests on its location in a reservoir, relative to the water column, the material from which the feature is composed and how it was built, and the rate of fill and fluctuation of the reservoir. This theme of location and composition is seen time and again throughout the cases discussed in this dissertation, and although not written about in this work, it is the theme that has applied to all of the submerged features in reservoirs around the world. Many regions of the world were studied, even tangentially, in acquiring information about reservoirs (broadly) from wave dynamics, to sedimentation and floral studies. Location and composition of archaeological materials is the conclusion that was come to, among many other conclusions, in the National Reservoir Inundation Survey, and just touched upon in the World Commission on Dams Report. That there has been such cohesion between all of these studies only reinforces the importance of the issue and the tremendous amount of work and responsibility due to submerged resources.

Submerged resources are most vulnerable when they are located in the draw-down zone of the reservoir, due to regular exposure to wave action, and the chemical alterations inherent in the drying and inundation of soils and floral material close to the feature. The physical changes that take place within the feature itself in the

draw-down zone include redistribution across potentially far reaching areas, and with little context remaining of where loose artefacts or pieces of the feature came from<sup>80</sup>. Redistribution of the site can wreak havoc, as smaller artefacts get washed away completely or caught up in other parts of the site, completely destroying context and potential interpretation. In particularly unfortunate cases, entire features are washed away, as displayed in the case of the Burnt Mound on the edge of the Camps Reservoir. The likelihood of that inkling of a feature surviving many more seasons of water level fluctuation are minimal.

Other threats to features in the draw-down zone include animal trample and interference, as flocks or herds begin to move into fresh areas to feed and wander, and human interference. Animal trample can disrupt soil contexts, compress layers, lead to the removal of protection flora, and physically move artefacts or parts of a feature into different areas. Other types of animal interference include burrowing activity, although nothing of this nature has been commented upon by these authors referred to in this dissertation. Nevertheless, the possibility exists to the same extent as on other, terrestrial, archaeological sites. Human interference is a high possibility. Farmers in the area, as observed in Scotland, reuse stones from old field boundary walls, knock over and redistribute parts of disused buildings for ease of access for

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<sup>80</sup> This problem was observed first hand by the author upon return to the Fruid a year after the fieldwork was completed. Across a swathe of land that was dived over to reach the Fruid cottage and workshop, a small group of archaeologists wandered upon a scatter of potentially Mesolithic (but inclusive of Neolithic) flint. Over 250 pieces of flint, of which 30% were worked, were found in an area no larger than 20m x 10m, and in the area of potential pits or post holes- all of which were unseen by the divers the year before. Evidence from the banks of the Fruid suggested that the flints had been uncovered, to some extent, by that season's heavy rains, which was followed by a dry period causing the reservoir levels to recede. That caused the erosion of peat from the reservoir banks, but whether the flints were suspended within the layers of peat or lay under those layers (atop a sandy silt) is unknown. All contexts were washed away. As the archaeologists attempted to record and collect the assemblage, some of the flints were caught in small, passing rivulets coming down through the peat, washing down toward the reservoir's new edge. How many other flints were washed down into the reservoir before the discovery is a mystery, as is the relationship of the flint scatter to the pits/post holes found in their vicinities.

themselves and livestock, and drive over even marshy land in 4x4s and tractors. That holds the potential of compressing sediments, and subjecting contexts to mechanical turbation.

However, even more critical to a feature's survival than possible protection from live-interference, is the very material from which the feature was constructed and how it was constructed. Any feature constructed using soil, including those features that are dug into the soil (i.e. ditches, mottes, postholes, pits) are at less risk of being destroyed than those above the level of surrounding soil. The water currents and suspended particular have less to erode in the former case, rendering above level features increasing eroded and abraded with each fluctuation in the reservoir's level. Features dug into the earth are still vulnerable, however, since that soil, too, is eroded away with subsequent reservoir level fluctuations. Stone and brick features, as displayed through all three case studies, show greater resistance to the effects of erosion and abrasion, though they are not invincible to these forces. Depending on the type of stone and age of brick, these materials can leach out salts and other soluble compounds from within (e.g. the sandstone at Philae). This poses less risk of structural integrity compromise in the short term, though consistent changes in water level, as evidence in Egypt, will eventually have an aesthetic and potential weakening affect on the material in question. However, there is little literature regarding the full effect of submergence on structures, and so the extent to which full submergence will affect an upright structure is still represents a gap in archaeological knowledge.

Features in the draw-down zone, while evidenced the most vulnerable, also present an interesting issue. Although a variety of features were investigation in the

Scottish fieldwork, including a varied assortment of features throughout the water column (all of which came back to the original conclusion that location is paramount to longevity of a site), the fact remains that there are many more archaeological features that have not been investigated in reservoir's depths. The same holds true in the case of both the Aswan Tailgate Reservoir and Lake Mead, where in both instances, rates of deterioration are measured primarily on the basis of those features' locations in the draw-down zone. Therefore, it is only with tentative assertion that this work deems features in deeper locations 'safe'. If attentions are only paid to features in the draw-down zone, little long-term understanding of deeper sites will be incurred, and therefore it only stands to reason that those deeper situated features also warrant investigation and careful monitoring for signs of deterioration.

All of the features that were investigated at deeper depths in reservoirs were in good overall condition, even in instances where some surface erosion or site redistribution had taken place. The factors contributing to those features' long-term prognosis include pollutants to the water (affecting long term preservation of some archaeological and historic materials), any sudden drops in the reservoir level that would expose them to effects similar to the draw-down zone, abrasion from suspended particulate, and over-sedimentation. Although complex, the occurrences of over-sedimentation and degree of suspended particulate can all be estimated using the same sedimentation models that reservoir engineers and managers use (see Arnold et al, 1995; and Morris & Fan 1998). Sedimentation models were using in predicting flow and sedimentation in the Three Gorges Dam, and similarly modeled calculations can be made with archaeological feature locations in mind (Fang & Rodi 2003). These models take some of the guess work out of attempts at locating known



features that are covered in new sediment, and predicts the extent to which that cover will weigh down on the newly compressed features, taking into account the possibility of chemical changes in that area of the reservoir.

Another issue that needs to be tackled with some scrutiny in regards to deeper features is the problem of diving in turbid water. While the turbidity of water did not deter any of the diving efforts put forth during this dissertation's underwater fieldwork, in several cases, the turbidity (even on otherwise calm days) did not allow photography of features. It is possible that low visibility in some cases was on the basis of diver error (i.e. finning too close to the bottom) although the author did not observe this, but overall turbidity is a factor that should be taken into consideration when devising a plan for long-term monitoring. Low visibility in diving is expected in some situations, and there is specialised training designed to assist divers in overcoming and handling it down to nearly zero-visibility.

In determining the long-term stability of a feature or set of features in reservoirs, one must also take into account the efforts put forth by engineers, local people and cultural heritage managers. If a holistic and well-managed approach is utilized, it is possible to ensure maximum protection and long-term stability of features. This is accomplished by the prioritization of features in the pre-inundation phase, which is usually accompanied by walkover survey, archaeological recording, and excavating. During the initial walkover survey, which could be accompanied by an engineer or reservoir basin projection plan to illustrate the geographic areas of draw-down zone, heritage managers should be on the lookout for features that are the most vulnerable. The typologies for these features are likely to remain the same, but the actual types of features (round house versus mud-brick hut) will differ on the

basis of regional and cultural differences. However, if the vulnerable features are prioritized for recording, excavation or *in situ* preservation (using methods to prevent erosion), the chances of losing archaeological data are diminished. Other types of archaeological heritage that has not featured in any of the case studies in this dissertation must also be considered. Rock art found in what is now Lake Nubia was never formally recorded, but it is unlikely that it will survive the many years of submergence and erosion of the paints on the rock surfaces. A similar situation exists in Pakistan, where rock art and petroglyphs, in remote areas planned as reservoir basin zones, are currently being recorded using easily transportable scanners (Bukhari 2012). In an area with high religious significance, it is critical that these valleys are recorded with as much zeal as possible (Hauptmann 2007). During the filling phase of the reservoir in the period post-survey (and post-mitigation measures), a fill rate as slow as possible will help to preserve submerged resources that will eventually be situated at the bottom of the water column. By limiting the effects of current and wave action over them, the effects of erosion and abrasion are also limited.

To best assist in prioritizing features and areas (aside from vulnerable ones in the draw-down zone), local people should be called upon to assist in identifying places of special connection, cultural identity, and priority. Holistic consideration of locals' priorities is key to long term management of sites in reservoirs. In some cases, hard compromises will inevitably be made, and it is possible that local populations will have no desire to work with archaeologists who may be viewed as working for the construction engineers or local government (Rocha 2012). Local populations are cultural heritage resource that cannot go untapped, despite potential

difficulties. Using joint fact finding missions from early stages in the planned dam and reservoir will highlight these areas of cultural importance, and allow more time for coming to jointly agreed upon methods of preserving, protecting, allowing access, providing for local stewardship and monitoring of the features, as well as allowing archaeologists the chance to engage with archaeology on a local and dynamic level. In addition to walkover survey and consultation with local populations, all stories and traditions associated with places of cultural interest should be noted as soon as possible from a variety of sources. This did happen at any of the places investigated for this dissertation, but for posterity's sake, these stories and traditions would have enriched and strengthened modern understandings of submerged resources, beyond that which the archaeology could solely convey.

This type of prioritizing work and engagement on a local level was the focus of Charles Arthur's 4-year mitigation project in advance of the Metolong Dam in Lesotho. In this 4-year project, Arthur (2012) utilized local knowledge and understanding of local history, providing archaeological and stewardship training for locals in Lesotho. Local people, rather than foreigners, took on the roles of archaeologists, conservators and managers, a unique contrast against the backdrop of times when local people were used for unskilled general labor (Arthur 2012). Arthur's work asserts the need and responsibility of foreign archaeologists to dam builders, human rights organisations and local communities in holistically considering features that will be submerged by reservoirs, at all costs; even when that cost is providing training for local populations to take control of their own past, and themselves taking a passive role in the entire process once that training has been completed. In areas where traditions, ways of life and sacred locations are likely to

be lost for hundreds of years (or completely), it is only through full cooperation with local populations and engagement with the sensitive issues surrounding the ethics of stewardship that real strides in cultural heritage management surrounding dams and reservoirs can be made.

Ultimately, cultural heritage managers represent those individuals on the ground, who have a tangible and current effect on submerged resources. They also represent a middle ground between practice (which can be good or bad), and the policies relevant to that location, region, country. Cultural heritage managers and archaeologists can make good decisions that positively impact local heritage, but this influence is limited to what can be done and how those acts of doing are defined. A good cultural heritage manager or archaeology contributes to the greater sphere of knowledge and understanding about the site in a holistic way (Smith 2000, 310). They publish, and disseminate their data to the public in easily accessible places, and they report back to the local populations with their findings. However, a poor cultural heritage manager or archaeologist does not do these things; publication about sites is limited, or non-existent. The site's function and role is not addressed holistically, and locals are not consulted with at every stage of the process. They are also unlikely to set good priorities for the soon to be submerged resources, focusing instead on margins and making poor decisions on the basis that progress cannot be halted.

The processes in which poor archaeological management and a lack of locally approved policy has been strongly contested, by "communities who have questioned the appropriateness of archaeological authority over their heritage and who have demanded that consultation with communities occur as part of both the

management and research process" (Smith 2000, 311; see for example, Langford 1983; Fourmile 1989a, b, 1992; Organ 1994; Ah Kit 1995). Codes of ethics amongst archaeological practitioners help to safeguard against breeches of ethical conduct, an occurrence far more common than is publicly acknowledged (see Chapter 4.1.2 UK Policy). Research and management projects must include negotiations (TALC 1995; see also Smith 1996 for discussion of this issue) on all practitioners' parts, in order for the greatest and most locally prioritized archaeological and cultural resources to have good prospects in the long-term. Smith (2000, 312) suggests that it is the processual theory in archaeology that has caused contradiction to policies and codes of ethics (see also Smith 1995; Thorley 1996). Smith (2000, 312) contends that,

"This is because processual theory can only, given the intellectual boundaries it sets for itself, incorporate knowledge and values constructed within a strict logical positivist framework. This means that Aboriginal knowledge, values and concerns often make little practical sense within either a research or a management process defined by processual theory. As a consequence policies of consultation have not alleviated all Aboriginal concerns about archaeological access and possession of their material culture."

Therefore, understanding and the very basis for archaeological must change if sites are going to survive and local populations acting, contentedly as stewards of their own past. This leaves the final important aspect in the long-term stability of sites: the policies that are shaped at the international and domestic level, and how these policies are interpreted and acted out (see Chapter 6.12 Policy-Action-Condition).

## 9.6 Cross-cultural examination of results

All three case studies, each from a different country represent similar results in the long-term stability of sites: location of individual features is key, as is the implementation of policy directed at those features in reservoirs and reservoir flood basins. Each of the countries has handled their cultural resources differently, and tackled submerged resources in different ways: from legal requirements and responsibilities of developers and government agencies to protect cultural assets, to initiatives aimed at the improvement of the understanding of reservoirs and their far-reaching effects. This section is dedicated to comparing and examining those differences and to come to the unique points in each country that would be of benefit to the others, as well as identifying those themes that underpin the current status of submerged heritage in all three countries.

### United Kingdom

As discussed, the RA 2011 is the single policy aimed specifically at reservoirs and is therefore the most applicable to managing and mitigating damage to features that are already submerged. There is no clause requiring it, and after interviews with HS and the RCAHMS there seems no immediate future for such a clause. Still, the RA 2011 is a good starting point for what an applicable piece of legislation could include, even if it is *sans* heritage consideration. Other relevant pieces of legislation and policy in Scotland include the new HESA and policy document, the SHEP. None of these acts or policies contain clauses relevant to resources submerged in reservoirs, and there are occasions when clauses pertaining to resources in reservoir flood zones are ignored altogether.

The benefits of these relatively new acts and policies are that they are current proof of a society constantly evolving in its determination to protect the historic environment, and although none of these documents expressly protect submerged resources, they are all moving in a direction to house such policy. The next step is to formally propose said policy, and rally support around the inclusion of it. Unfortunately, in the time it takes to lobby for support and improve protection and mitigation of submerged resources, those very resources (especially those noted as vulnerable or priority in status) will likely be destroyed. Because Britain does not have a record of relocating sites (as Egypt does), it is unlikely that any features currently in reservoirs could be moved, and the viability of this approach is dubious since those features that are most vulnerable in draw-down zones are primarily earthen/natural in their typologies and relocation would be impossible.

#### United States of America

In the USA, the Reservoir Salvage Act has the greatest bearing on features that will be submerged in reservoirs. Enacted at a time when dam construction in the USA was at an all-time high, the Reservoir Salvage Act was put into place with the specific concerns of submerged archaeology central to the piece of legislation. The Reservoir Salvage Act is likely to quell the concerns of future cultural heritage managers in that, through this piece of legislation, they have the authority to preserve, consult, excavate and monitor. Within Lake Mead, the Submerged Heritage Unit (a part of the National Parks Service), have launched a series of monitoring cameras at a crashed aircraft site. This is similar to the camera monitoring systems installed at the USS Arizona at Pearl Harbor. However, this monitoring system has little to do with monitoring the crash site for leaks (which is

why those systems are installed at the USS Arizona), instead allowing online viewers to observe the submerged heritage in that reservoir. Perhaps this system has the potential for use in many more reservoirs, and not just those based in the USA, allowing divers to decrease the risk associated with diving in contaminated waters, or those deemed too risky for diving<sup>81</sup>.

## Egypt

Egypt has little to offer in the way of current policy or legislation that applies to submerged resources and little in the way of resources and political recourse at the moment, given the instability. However, as Egypt emerges from the current political debacle, she will in time turn her attentions again toward heritage matters and the policies surrounding them. The works currently underway to establish a thorough Environmental Impact Assessment system are a sign that Egyptian policy is evolving, and whether it will become similar to the western policies present in the UK and the USA is unknown. Given Egypt's strong former connections with Britain and continued reliance on European and UN aid programmes, a heritage system similar to those in the west is likely. This is disregarding the potential for a government system increasingly based on Sharia Law, as mid-term constitutional votes were not in favour of maintaining aspects of that constitution that emphasized Sharia Law (Sharp 2012; Sharp 2013; Rousseau 2012; Moghadam 2013).

Regardless of potential monitoring works or policies, since this area is yet unclear and in upheaval, Egypt's current priority is managing the range of monuments and museums dedicated to the artefacts already excavated. The long-

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<sup>81</sup> For example, the Aswan Tailgate Reservoir and Lake Nasser have suffered periods of infestation with Schistosomiasis (blood fluke) that requires complete body coverage when entering the water, lest the parasite infest the host. Lake Nasser is also home to the Nile Crocodile and Nile Carp, both of which present a life-threatening, though improbable, threat to diver safety.



term management of the temple complex at Philae is included as part of this priority, although the submerged resources remain, as in other countries, submerged and distinctly unstudied. In managing the relocated structures along the Nile, Egypt continues to promote tourism, which drives its currently faltering economy. And so in protecting what is above the water now, aids in the long term stability of those site in the water, since a country that is both unstable and with a poor economy is less likely to concern itself with matters of submerged archaeology (Fiallo & Jacobson. 1995; Cleere 1990; Agrawal & Gibson 1999).

### Juxtaposition

The themes common to all three of these countries is the lack of system for monitoring features that are already submerged (despite the monitoring of an air crash site in Lake Mead). There is no systematic means or precedent of monitoring, nor precedent for consistently mitigating damage. In Scotland, where features are known to be in danger, only a handful of amateur archaeology groups have come to the aid of the threatened features. While some attempts to dive in reservoirs have been made in the US by the National Park Service, there is no national policy aimed at regular monitoring. No best practice guidelines exist in any of the countries. Professor Andy Hughes, of the British Dam Society, has asserted the urgent need (due to the lack) of best practice guidelines for dam engineers. His experience in large dam building was such that no guidelines existed when engineers were faced with decisions about heritage in the reservoir flood basins, despite very specific literature being available about other aspects of the environment from Environmental Impact Assessment regulations to types of access to the basin in cases of delicate ecosystems in the surrounding area.

To date, the policies and procedures in Egypt have had a positive effect on the actual monuments that were relocated. Although their submergence would not have caused their demise, the relocation of those monuments was a true success, and that the government went so far as to recreate the complex on an island that is landscaped similarly to Philae is a true accomplishment. In the USA, the Reservoir Salvage Act has prevented the destruction of a number of Native American sites, and provided archaeologists with a wash of information about those sites, as well as the formative years of the country. Britain, only, lacks in similar success stories of relocation or consistent protection schemes in regards to sites pre-inundation, and would therefore benefit from an equivalent Reservoir Salvage Act. Scotland is posed to implement the types of changes would allow it to set precedent both in pre-inundation preservation, as well as post-inundation monitoring.

However successful Egypt's relocation of monuments has been, the American system of pre-inundation protection, or how poised Britain is to take a leading role in holistic reservoir management, the simple fact remains that none of these systems have taken into consideration the long-term effects of submergence, and how they can continuously monitor submerged heritage -known or unknown<sup>82</sup>- well after the reservoir has been operational. To support this possibility, one needs only turn to the National Park Service "National Reservoir Inundation Survey", or the underwater fieldwork conducted in Scottish reservoirs for this research.

## 9.7 Case Study Submerged Resource Themes

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<sup>82</sup> Unknown since some discoveries of archaeological materials were only made after the reservoir's fluctuations had eroded away topsoil, exposing them.

The individual features investigated in all of these case studies, though not managed through any specific legislation, are in as varied condition as the sites are in typology, age and location. Vulnerable features in draw-down zones are generally in poor condition, with brick and stone features displaying greater tolerance to draw-down fluctuations, erosion, abrasion and floral growth. While earthen features are in better condition when in deeper areas of the reservoir than those features' counterparts in the draw-down zone, brick and stone features at the same depth withstand submergence still better. This observation is consistent across all three case studies, although the mud-brick settlements in Egypt have remained without survey or siting since their submergence. Nonetheless, that they survived the half-century of yearly fluctuation along with the temple complex on Philae, suggests that while their condition may be severely threatened, they may well survive and still bear archaeological data and historic importance. The same potentiality exists for the variety of earthen or less-vulnerable features in the US and Britain.

## **9.8 Relationship between Society and Heritage**

The relationship between society or regional culture and whatever type of cultural heritage (or archaeological feature) in question also has a large part to play in how that country manages its cultural resources. Nationalism, prevailing trends, economic viability, and cultural/spiritual attachments all feature as factors contributing to that relationship and the consequences of that relationship. In the case of the three case studies focused upon in this research, each country has its own cultural heritage agenda. Those agendas were formed on the basis of local and

national attitudes, quite specifically in this discussion, about the resources that were submerged in the reservoirs.

Self-identification of culture forms the basis for most aspects of decision making, whether on personal, regional or large-scale levels (Gupta & Ferguson 1992; Polletta & Jasper 2001). In assessing how this affected decisions regarding submerged resources in the Scottish reservoirs, it is interesting to note that in none of the features studied or investigated was there trace evidence to suggest a decidedly Pictish or Celtic origin, particularly not of the type that would draw tourism to the given regions. Nevertheless, there are a number of National Preliminary Flood Risk Assessments for sites listed by EH, HS and CADW. If the national trend is to protect only cultural assets that promote a national identity of, for example, Celtic or Pictish origin (and one that enhances national socio-economic ambitions), then it is unlikely that any particularly strong push to promote the mitigation of damage to non-identifying heritage will be made. This might not occur through deliberate malice, but rather, such strong cultural and goal-driven identification, that it happens nonetheless (Diaz-Andreu & Champion 2014, 3). The deemed unimportance or less-than-keynote places of heritage have the potential to slip through the cracks.

In the case of Egypt, the self-identification of peoples is not on the basis of religion but largely on ancestral lines tracing back to the ancient Egyptian period of monumentality and pharaonic dominance (Hassan 1998; Reid 2002). Here, then, the case study illustrated that the monuments of ancient Egypt were relocated to save submergence, despite professionals' assertions that the monuments would survive that submergence. The monuments, part of the broader Egyptian identity of

pharaonicism and monumentality, were saved, despite the numerous features that were unlikely to survive long-term submergence.

The USA is no less well acquainted with these methods of determining which type of heritage is interesting or relevant to identity, and therefore worth protecting. Headway has been made in this area over the last several decades, due to political actions like NAGPRA, the civil rights movement of the 1960's, and the consistent push for recognition of diverse heritages and histories by the American Civil Liberties Union, and 'minority' activism groups in the country (e.g. the NAACP, La Raza and the Hispanic Federation). At the time of submergence, little care was taken to preserve and stringently record places of minority heritage, particularly not of Mormon historical importance (Alexander 1996). At the time of the submergence of St. Thomas, given the economic crisis in the US and around the world, the increased need for fresh water in the arid southwest, and the urgent need to create jobs, the flooding of a small Mormon town was the least of American worries. Best of all, the Mormons were still a relatively fledgling Christian denomination, having traveled west to seek freedom of expression from its formation in Illinois in 1860 where a different type of conservative Christianity was preferred (Alexander 1996). Relocating a small Mormon town's occupants, unconcerned with potential changes in tradition or historic connection to the area provides an historical mirror of the events that unfolded between mainstream Americans and the Native American tribes pushed further from their origins in the west, as well as hint at the continued disruption of indigenous people's homes, traditions and sacred spaces.

There remains a consistent method for protecting features based on this relationship between populations, identity and heritage. However, there are also

factors related to a feature's impact or importance in the archaeological record. Is the feature a key example of monument building during the Iron Age, for example? Is the feature likely to provide evidence for claims related to the Neolithic transition? Will it shed light on key aspects of the area's settlement? All of these research questions are valid, but should not be confused with qualifiers for that feature's protection, since they are research aims. Research aims should not be confused with long-term stewardship and meaning to indigenous groups, or the meanings that are yet to be revealed in the populations that will outlive our own.

## **9.9 Application of data to uninvestigated sites**

The data and understanding of submerged resources gained through the research undertaken in this dissertation, and the analysis of the policies relevant to those resources are all assets that can be utilized in other areas of investigation, in a variety of ways. First, it should be applicable in cases of uninvestigated submerged resources, and cultural resources that are not yet submerged. Through the recorded location of features in reservoirs, it may be possible to use the data collected in this dissertation and aspects of it, for expansion into a GIS model. Such a GIS model would yield powerful results that include data inputs from hydrography, sedimentation, pollutant sources, and erosion rates when combined with distinct weather patterns (Moore et al. 1993; Cai & Fan 2003). It is also possible that this research is applicable to areas of research that were not covered in this dissertation: sites in coastal zones, where threats of erosion from rising and changing seas present themselves, as well as in the offshore industry, where construction projects of oil as well as renewables have the potential to redirect currents underwater. This section

takes these potentialities step-by-step, beginning with a applicability to two case studies that were initially considered for inclusion in this dissertation: the island of Ada Kaleh in the part of the Danube known as the Iron Gates Gorge, and Norsuntepe Tell (mound) in the Keban Reservoir in Turkey<sup>83</sup>.

The first step in applying the data in this dissertation to the other sites involves determination of typology, depth and hydrology understanding and other factors linked to damage. In the case relating to these two divergent case studies, relative data includes that which is known: an assessment of all archaeological sites known and previously recorded (if such a record exists), the depths of the sites, and the flow and fluctuation rates of both reservoirs. After this data is collected, each feature's location in the reservoir can be determined through archival referencing and aerial photography. By placing a feature in GIS, other data can then be entered: wave action and weather patterns, fluctuation rates and draw-down zone, and data collected from sedimentation models specific to that reservoir. Without GIS, educated assertions can still be made, although the use of GIS enhances accuracy and dataset. However, to be certain that GIS is accurate, since it has not been tested in this specific capacity, diver-survey follow up is recommended for initial accuracy checks.

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<sup>83</sup> The two applicable case studies both have different and complicated histories associated with them. Ada Kaleh, an island now sunken in the Iron Gates Gorge was once a meeting point for Romanian and Ottoman culture, before its submergence in 1972 with the opening of the Iron Gate I Dam. The island is completely submerged in over 20m of water, which flows at a slow but constant rate, channeling through the Iron Gate I Dam. Norsuntepe Tell, is a mound sunken in the Keban Reservoir in Turkey. It was submerged as a result of the creation of the Keban Dam, flooded in 1974. Norsuntepe is only partially submerged; the highest point of the Tell protrudes from the reservoir, forming what appears to be a small island. Instead of a modern meeting point of cultures, Norsuntepe contained evidence of habitation from a variety of ancient cultures: Scythians, Hittites, Greeks and Romans all left archaeological evidence. Both examples taken together represent a great variety of types of archaeological sites, materials they are formed from, and different effects, given their different locations in reservoirs. The research compiled in this dissertation is applicable to these sites in determining to what extent the remaining archaeological features and landscapes are damaged, or otherwise disrupted.

Applying data to these two case studies cannot be 100% accurate, due to lack of follow up surveys to determine extent of accuracy. Norsuntepe is likely damaged, due to its position in the draw-down zone. The last 40-years of reservoir level fluctuations would have eroded away the sides of the mound, as evidenced in the Upper Glendevon in Scotland, leaving a mound that may be significantly smaller and shaped differently from the original mound. Top soils are likely eroded away, which may have since exposed previously unrecorded archaeological features, with the potential for these features to have been spatially and contextually compromised due to redistribution of artefacts and other associated materials. Remains of the Scythian horse grave, noted by Mellink (1972), have most likely washed away. Previously recorded features, depending on their vertical location on the mound, will have sustained a degree of damage through erosion and wave action: soils will have been eroded away, and even stone features will have been abraded to some extent by suspended particulate caught in waves and currents.

Ada Kaleh, alternatively, is fully submerged and has never surfaced in the Iron Gates Gorge. Because of its depth, it has probably sustained some degree of protection from the forces of wave action, saving that wave and current action that would have initially covered it. The majority of features on Ada Kaleh were structures, toppled before the Iron Gates Dam was constructed, so that the tops of them would not interfere with ships on the Danube. This presents a similar set of circumstances to the cottage and workshop encountered in the Fruid, which were both largely undamaged. It also bears a resemblance to the town of St. Thomas, in that it was, essentially, an island-city. Although larger and more densely populated than St. Thomas, the great number and variety of structures, in toppled states of



stronger materials (e.g. stone or brick rather than of dug or mounded soil), probably suggest that the degree of survival is good. Assuming erosion from currents in the Danube has been kept to a minimum (this is uncertain), there is also a high probability that the island will retain other aspects of its archaeological data. For instance, there is some dispute over whether a Turkish fort was built on the remains of a Roman fortification (mid-late Roman, of disputed age), which would have been a *quadriburgian* style, square Roman fort (Bondoc 2005). It is possible that not only does the archaeological evidence for such a fort still exist, but due to its current status as submerged archaeology (and not an ethnically or culturally charged location), underwater archaeological investigation can take place with less political tension.

The lessons learned from this research may also be applicable in terms of climate change models, although full applicability would require further research. Wave action and its effect on archaeological material is well understood. Combining the data from reservoir draw-down zones, which are similar to coastal zones in that they are in a constant state of flux. With the inclusion of GIS models new light may be shed on how sites will change, and at what rate they will change given their unique environs. The outcome is a better plan of action targeted at protecting vulnerable coastal heritage. Not all reservoirs need GIS for this data to be applicable though. The results of this research are inclusive in that draw-down zone features will always be more vulnerable than features in the rest of the reservoir, with earthen features given priority due to their highly fragile nature and because they are easily displaced. Furthermore, combined with current understanding of hydrologic flow, then the understanding of how those flows and distances from them (may provide for

predicting short and long term effects on archaeological features: useful in channels and zones where renewable technologies are being developed (Holden et al. 2006). If cultural heritage managers are capable of protecting and thoroughly recording the features present in the draw-down zone, longer-term management of the features more deeply submerged becomes a simpler and streamlined task, as they become less likely to undergo extreme destabilization in a short period of time.

## **9.10 Sites and Dams as Peace-building Tools**

Although reservoir flood basins and dam construction projects may present themselves as hotbeds for the eruption of latent conflict, intercultural conflict, or interstate conflict (e.g. the Belo Monte Dam in the Amazon, or the Great Ethiopian Renaissance Dam), dams are also capable of acting as the peace-building tools in regions with conflict. Because dams are large, and necessary developments, targeting them for peacebuilding functions is preferable to their relegated status as points of conflict. Creating a dam or reservoir that functionally builds peace is a multi-tasked challenge, particularly when questions of government trust, cultural spaces, and the potentially negative consequences of dams (e.g. the displacement of indigenous peoples) are taken into account on a case by case basis. Dams certainly have a high degree of conflict-inciting potential. Redefining them as peacebuilding tools is the first step in converting those old beliefs, and attempting to turn on its head, the idea that dams only destroy all cultural heritage: a point that has been consistently argued against in this dissertation. First, the question of what peacebuilding constitutes. Johan Galtung, the father of peace studies, contributed his understanding of peacebuilding as "an endeavor aiming to create sustainable peace

by addressing the 'root causes' of conflicts and eliciting indigenous capacities for peaceful management and resolution of conflict" (1976, 297). In *Agenda for Peace*, the UN defines peacebuilding as a process that consists of "a range of activities associated with capacity building, reconciliation and societal transformation. Peacebuilding is a long-term process that occurs after violent conflict has slowed down or come to a halt" (Boutros-Ghali 1995, 61). Peacebuilding should not be confused with peacemaking and peacekeeping, since those two forms of peace reconciliation are less associated with development projects. Peacemaking is the "diplomatic effort to end the violence between the conflicting parties, move them towards nonviolent dialogue, and eventually reach a peace agreement" (Maiese 2003, paragraph 6). Development and development projects aim to move parties away from confrontation and violence, and towards political and economic participation, peaceful relationships, and social harmony (Doyle & Sambanis 2006, 2). In order to accomplish this and initiate dams as peacebuilding tools, all stakeholders must be involved in the development dialogue from the earliest stages, including periods of joint fact finding (Doyle & Sambanis 2006, 3; Fisher & Keashly 1991; see also Hampson 1996; Mitchell, Kadera & Crescenzi 2009).

Peace is wrongly perceived as the absence of war. This negative definition is better replaced with peace defined as "the development of factors of cooperation and integration between communities and nations in order to promote lasting peace" (Jeong 2002, 27). International and interregional cooperation between states is crucial to that peace process, and when water resources come to the fore, this cooperation is even more important to the maintenance of that peace. The cooperation and integration between communities includes opportunities at joint fact

finding missions, dialogue between stakeholders, and the emphasis that communities and nations are working and investing in a project together, toward the benefit of all parties involved. To achieve this, dams must be made beneficial, not only to states involved, but also to lesser political and socio-economic groups. Beneficial has divergent meanings to different stakeholders. Tackling this ambiguity and understanding what is beneficial to each stakeholder, why, and how benefits can exist without contradicting the benefits to another stakeholder is at the heart of the joint fact finding phase.

If constructed without stakeholder involvement, conflict will ensue. If sustainable peace is defined as a "situation characterized by the absence of physical violence; the elimination of unacceptable political, economic, and cultural forms of discrimination; a high level of internal and external legitimacy or support; self-sustainability; and a propensity to enhance the constructive transformation of conflicts" (Reychler 2001, 12), then a badly managed dam and reservoir construction programme is the exact opposite of this. Conflict and protest will erupt on the bilateral and domestic stages. Reychler (2001, 12) suggests that the requirements for sustainable peace to flourish are effective communication, consultation, and negotiation at different levels; peace-enhancing structures; an integrative moral-political climate; and objective and subjective security. All of these requirements point to dams as potential sources of new or renewed peace in an area, while equally pointing at them as the polar opposite: and this is when problems arise.

International development and development of dams may result from interventions and funding from the World Bank and large international development organizations. They directly fund dam development programmes, because dams are

considered a pivotal aspect in creating renewable energy and provided adequate agricultural and drinking water. A correlation exists between development and peacebuilding success (Smoljen 2003, 237). Junne and Verokren (2005) see development in this capacity as the quintessential definition of "good" development. Development is about "improving the standard of living for all people in poor countries" (Junne & Verokren 2005, 3), where standards of living include health, environment, education and political participation. If constructed and planned properly, a large dam project will create opportunities for education and political participation, while improving conditions of health and productive environment, thus promoting a continued atmosphere of peacebuilding.

Dams and reservoirs also feature as peacebuilding tools through the raising of issues surrounding cultural heritage management. The presence of archaeology or culturally important sites can provide the impetus to conflict, but when managed holistically and from the earliest of planning stages, may provide the impetus to community and conflicting faction cohesion (Ukpokolo 2006). Cultural awareness and training of a diverse number of local peoples in heritage management and archaeology creates a new atmosphere through which positive experiences of other cultures may be enhanced. This reflects the opportunities at peacebuilding through sports (see Höglund & Sundberg 2008; Kidombo 2012). "Part of the work that archaeologists do" and can do in regards to reservoir flood zone sites specifically, "is demonstrate inclusion by including everyone in the past" (Little 2009, 117). If holistic management is undertaken, this inclusion of everybody in the past can lead to improved cross-cultural relations, providing a commonality for working together and maintaining a peaceful society. In essence, dams and reservoirs, when managed

well, provides a place for divergent groups to confer, work together, and create a record of a shared past. In recording the shared past, they also provide for the heritage that will be submerged; it will be protected from acts of vandalism or looting, accidental destruction (i.e. conflict-based), or disuse/dilapidation. As stewards of that submerged past, they promote peace and cooperation on a local, regional and interstate level.

Not all instances of dam building have been hailed as successful pinnacles of the peacebuilding process. Archaeologists, it seems, still have a lot of work to do in terms of the ethics of salvage archaeology in locations where the dam had been contested from the onset. Where local populations are in direct opposition to the dam and reservoir, archaeologists are beset with the ethical question of whether to dig or not to dig, often coming into conflict, themselves, with local populations should they decide to dig (Hafsaas-Tsakos 2011). If dams can really be utilized for peacebuilding, responsibility rests largely on the shoulders of archaeology to determine whether their collective involvement and legitimization of dam construction projects is ethical. Involvement that is deemed unethical allows archaeologists to bond with the local people, whose heritage it is in their (the archaeologists') best interest to protect, therefore helping the peace process. In situations where there is clearly a breach of ethics and archaeologists continue to dig, thereby legitimizing unpopular or criminal government actions, archaeologists join the ranks of that criminality, focusing solely on monetary gain or specific information collection, rather than the holistic issues presented (see Hafsaas-Tsakos 2011; Kleinitz & Naeser 2011).

## 9.11 Cooperation between Nations

The issues of international cooperation regarding the preservation of submerged cultural heritage are inextricably linked to those of the use of international waterways such as rivers, streams, lakes, and reservoirs. As the global population continues to expand and the climate changes, the demand for water will become more contentious in the coming years. The fact that water is becoming an increasingly scarce commodity throughout large portions of the world cannot be disputed. The United Nations Environment Program (UNEP) stated in its 2002 Atlas of International Freshwater Agreements, “Population growth, economic development, and changing regional values have intensified competition over water resources worldwide, leading to predictions of increasing future conflicts over shared water supplies” (UNEP 2002).

This issue has been a focus of the United Nations as early as 1959 when the General assembly adopted Resolution 1401(XIV), which stated that it was “desirable to initiate preliminary studies on the legal problems relating to the utilization and use of international rivers with a view to determining whether the subject is appropriate for codification”. Serious work began on the issue when it was referred to the International Law Commission (ILC) in 1974. Over the next twenty years, the ILC worked on the issue, finally submitting its framework to the United Nations General Assembly (UNGA) Sixth (Legal) committee (Yearbook of the International Law Commission Vol II Part 2 1994). From this framework the 1997 Convention on the Law of the Non-Navigational Uses of International Watercourses was produced. The treaty was opened for signature and accession in 1997 and will

enter into force when 35 states parties have deposited notification of ratification or accession. To date, sixteen states have become party to the treaty.

The crux of the Convention can be summed up in the reading of Article 5.2, which states:

“Watercourse States shall participate in the use, development and protection of an international watercourse in an equitable and reasonable manner. Such participation includes both the right to utilize the watercourse and the duty to cooperate in the protection and development thereof, as provided in the present Convention.”

Article 6 establishes the measures of equitability and reasonability stating that such measures will be given weight in accordance with other relevant issues. For the purposes of cultural heritage factors that will be impacted by the use of the international waterways, this Article also states that social needs (Art. 6.1.b) and conservation (Art. 6.1.f) are pertinent factors in the consideration of equitable and reasonable use of international waterways. As the issue grows in importance, it is highly foreseeable that such an overarching treaty will be looked to in order to augment or replace the patchwork of currently existing bilateral and regional measures.

One such bilateral measure that is well established and fairly comprehensive with regards to the utilization and protection of water resources exists between the United States and Mexico. This arrangement began in 1848 with the signing of the Treaty of Guadalupe Hidalgo which under Article 5 states that the certain parts of the border between “The United States of America and the United States of Mexico [shall] follow the center of the channel of the Rio Grande and the Rio Colorado” (Treaty of Guadalupe Hidalgo. 1848). However, due to the natural forces acting on



rivers and the changing nature of a natural riverbed, a number of temporary commissions were established and further agreements were made into the regarding the demarcation of the border. In 1933, again through bilateral agreement with an effort to finalize the border, a project was undertaken to straighten and control the flow of the Rio Grande for 249 kilometers along the El Paso-Ciudad Juarez basin. In 1944, the International Boundary Water Commission (IBWC) was established for, *inter alia*, the handling of disputes between the United States and Mexico with regards to border demarcation and the use of the water contained in the border and international waterways. Further agreements over the next thirty years resolved disputes and established agreements for the use allowances of the international waterways between Mexico and the United States. More germane to the scope of this section, the IBWC has adequately served as a comprehensive dispute resolution vessel for issues pertaining to the waterways.

However tangential the above may seem, such measures are, without a doubt, crucial to the future of the preservation cultural heritage sites in areas affected and potentially affected by rivers and dams. Aside from the establishment of localized organizations such as the IBWC, many of the disputes that arise out of water usage and heritage have been decided through arbitration and adjudication. One such case is *Northwest Indian Cemetery Protective Association v. Peterson* (US 9th Cir., 07/22/1986). In this case, the 9<sup>th</sup> Circuit Court found that a construction project proposed by the United States Forest Service in the Blue Creek Unit of the Six Rivers National Forest would directly impact the practice of the Native American's First Amendment rights—specifically the right to free practice of their religion. This move towards adjudication in such disputes was reinforced by the Native American

Graves Protection and Repatriation Act (NAGPRA) (25 U.S. Code 3001 et seq.). Article 15 of NAGPRA states that any and all violations of the act will be addressed by the United States District Courts and such Courts will have jurisdiction to issue orders in the enforcement of the act as necessary.

Further, the United Nations Educational, Scientific, and Cultural Organization (UNESCO) Convention Concerning the Protection of the World Cultural and Natural Heritage (UNESCO 1972) continues this vein of protective measures. Article 4 of the Convention mandates that each state party, *inter alia*, protect the cultural heritage resources that are contained within its borders. Article 6 states that such resources are, with respect to the sovereignty of the states wherein they reside, part of the cultural heritage of the world as a whole. To assist in the preservation of cultural heritage locations, the Convention, under Article 8, establishes an intergovernmental committee known as the World Heritage Committee.

Much like the IBWC, the World Heritage Committee has competence to receive claims and disputes regarding cultural heritage sites. This is not strictly spelled out in the Convention but it can be inferred to be within the scope of the World Heritage Committee's focus. Any state party to the convention can request assistance from the World Heritage Committee for the protection of cultural heritage sites within its borders. It is foreseeable that an instance will occur where a dispute arising from a proposed impoundment along a border of two state parties could lead to a request for international assistance from the World Heritage Committee. One such international reservoir is Falcon Lake; a 33,854 hectare reservoir 64 kilometers southeast of Laredo, Texas, and sharing its waters jointly on the border between the

United States and Mexico. This reservoir and its construction was overseen by the IBWC and posed little known impact to the cultural heritage of the area. However, it does still serve as an example of a potential future problem where the World Heritage Committee would be called upon to resolve a dispute.

Taking the two seemingly disparate issues of cultural heritage and water rights together, one can understand the real potential for significant dispute in the very near future. As the demand for both water and power spurs the increased production of dams and the resulting reservoirs the potential for international conflict—albeit of a likely nonviolent nature—is real. The 1997 Convention on the Law of the Non-Navigational Uses of International Watercourses, for example, mandates under Article 33.10 that in the absence of a viable agreement, state parties can declare to the “Submission of the dispute to the International Court of Justice and/or [submit to] arbitration by an established tribunal...” The provision also allows for the use of regional economic integration organizations, such as the IBWC, as the arbitrary body.

These frameworks already exist in many locations. However, the expanding need for water and its impact on cultural heritage sites does not necessarily need to be a cause of international strife. With proper communication between states, the construction of new reservoirs can instead be the cause for greater international cooperation. The IBWC is an example of a regional organization created to resolve a series of disputes that has since fostered greater cooperation between two states.

In an interview with Independent Conflict Resolution Consultant Adrian Traylor (15 March 2013) and International Human Rights Specialist Tara Van Ho (15 March 2013), a scenario was constructed, based on existing measures wherein

two states could turn a potential bitter dispute into grounds for cooperation. In this scenario, one state wishes to construct a dam that would result in the creation of a reservoir that would cover an important cultural heritage site of a neighboring state. Through the UNESCO Convention on World Cultural and Natural Heritage the state being affected by the reservoir could appeal for international assistance. The World Heritage Committee could then use its good offices to provide a forum for mediation of any issue and cooperation on the survey and cataloguing of the threatened sites. If such mediation fails, then the Convention on the Law of the Non-Navigational Uses of International Watercourses—pending its entry into force—could be used as a cause for referral to an established arbitrary tribunal and eventually the International Court of Justice.

However, this does not have to be the case. States can use the need for water and the desire to protect cultural heritage as a basis of future cooperation. Rather than creating conflict, the states involved in international projects may in fact find it more advantageous and expedient to work together on the preservation of cultural heritage, which is often a shared cultural heritage along border regions. The international assistance provided by the World Heritage Committee could be that of providing expertise and funding for the survey and preservation of the sites, as per Article 22.

As the need for water and the desire to impound more in reservoirs grows in the coming years, the potential for conflict also grows exponentially. There are in existence multiple means for the resolution for these nearly inevitable disputes. With the focus on supplying a nation with life sustaining water, a state can easily lose focus of the impact on the cultural heritage that such sustainment activities could

incur, both domestically and internationally. However, with the use of the Convention on World Cultural and Natural Heritage and the Convention on the Law of the Non-Navigational Uses of International Watercourses, the impact can be mitigated and greater international cooperation can be fostered. There is both a great potential for increased strife and opportunities for increased cooperation. Only time will tell what course will be taken.

## **9.12 Policy-Action-Condition**

The case studies that centred around Lake Nasser, Lake Mead, and the reservoirs in Scotland provided evidence to suggest that, contrary to claims of destruction, there are types of archaeological features that survive and there are those that are extremely vulnerable. In the chapter concerning heritage legislation and policy in these countries, evidence was presented that there exists suitable existent legislation and governmental framework for submerged resources (i.e. their protection, monitoring and mitigation of future damage) to be considered more holistically. Gaps in the legislation make it not only possible, but relevant and timely given the high number of submerged or potentially submerged archaeological resources in all of these countries' reservoirs, and the increasingly unpredictable weather patterns that will continue to shape and shift the currents and very shape of those reservoirs. Consideration of how submerged resources have been affected provides better data that allows policy makers better-informed decisions about the future of dam construction works and hydroelectric schemes as far as archaeological works and conservation is concerned. Better data also ultimately means less money spent on certain types of archaeological salvage works, and time better spent on

meaningful dialogue with local populations and determining the means through which particularly vulnerable resources can be saved. This translates into good and holistic policy, if not aimed at the protection of resources submerged through past actions, then at least aimed at the best possible management of resources in the future.

How policy is implemented has an effect on archaeological sites in reservoirs, and it is through policy that one achieves an idea about how those resources will survive. Understanding that policy and its historic setting is a step toward better understanding and analysis of modern policy and practice, and more important that this is understanding the directionality policy can have.

Policy at the domestic level can provide the basis for protection and understanding of cultural heritage assets, when implemented holistically and in such a manner as to not ostracize local or indigenous populations. It can assist in the efforts at long-term preservation and understanding, without which, archaeology, as a discipline, would cease to exist. It has a direct effect on archaeology, and notably, that archaeology found in reservoirs and reservoir flood basins. Policy, however, is only one part of the holistic management process. It is possible that even without set policies, as were in place in Egypt, some types of archaeology would have continued to endure the long years of submergence. Therefore, policy as a vessel of protection, offers this protection and understanding to sites that are deemed a priority to policy makers, and that protection, as acted upon in all three of the case studies presented in this dissertation, is largely aimed at the protection of large, durable monuments, rather than at vulnerable and lower-priority features. Policy prompts action, which in turn leads to a condition of heritage, but that condition ranges from good to poor,

depending on how those policies and actions are carried out. The lingering problem with policy is that unless it is very carefully formulated and crafted to provide action and protection for vulnerable resources, only the obvious or monumental (i.e. priority) features are the focal point.

In all of the case studies presented, policy has had some direct effect on the actions undertaken in regards to those specific regions, and the actions undertaken directly affected the long-term condition of archaeological resources. In Egypt, the relocation of the many large monuments and temples associated with Philae was a success, but at the detriment of the more vulnerable and less-prioritized features on the original island. In the USA, there was little effort at the long-term understanding or preservation of what would come to be understood as an historically important town for the Mormon community. It was only after the long years of submergence, that the importance of the town of St. Thomas came to the fore, and it was most fortunate that the town was of such a material composition and of the right depths for protection that it remains, to an extent, intact and enjoyable as a tourist site and a place of study. That St. Thomas exists in its current form is, however, an accident. There was no intentionality exhibited in the pre-submergence treatment of the town, no pre-submergence understanding of its location in Lake Mead, and should Lake Mead ever fill to its peak levels again, there remain questions about how the National Park Service will manage the setting in such as way as to provide protection to it (if needed) and access to it (e.g. video monitoring or underwater archaeological tourism). The reservoirs investigated in Scotland vary in the types and amount of archaeological materials submerged, but the policy and action surrounding those submerged resources is similar. There have been no policies regarding what was

submerged and there were few actions taken, although the independent survey of the Cramalt Towers serves as an exception to this. The continuing actions taken in Scotland are those undertaken by archaeologists only when water levels recede sufficiently to allow ease of access, and most of these actions have been undertaken by amateur archaeology groups to whom local history and identity is important, and not solely represented by the monuments preserved and managed by Historic Scotland. That there are a number of calls for monitoring and recording of vulnerable features in draw-down zones and those calls have been met with a limited degree of responsiveness from Historic Scotland and the RCAHMS illustrates the lingering issue of a set of policies (i.e. policy makers) only interested in the monumental.

If policy creates action, and action or non-action generates condition, then what one must also take into account is that condition should generate action, and enough action or non-action should and must prompt policy. The channels for policy, action and condition are multidirectional, and when a top down approach meets lack of understanding of processes in reservoirs, then a bottom-up approach is what is called for in a systematic and action-oriented way.



"Power concedes nothing without demand. It never did, and it never will."

-Frederick Douglas

## Chapter 10: CONCLUSION

From the effects and efficiency of the policy process through to the tangible effects that submergence has on archaeological and cultural heritage, several points remain evident: ideas surrounding submerged heritage are not always accurate. Archaeological features undergo inundation due to the creation of large dams and reservoirs do not inevitably face destruction. Instead, a spectrum of consequences emerge from the reservoirs, ranging from protection and accidental *in situ* preservation to complete erosion of sites, all of these factors based largely on those features' locations in the reservoir. The most dramatic changes in features occur in the draw-down zone, and places in the reservoir with the greatest water level fluctuations. Other features may undergo less obvious alterations in their chemistry.

Most damaging to submerged heritage in reservoirs is the fact that they are generally ignored post-inundation. Without a monitoring scheme or some protective maintenance or active conservation, the long-term survival of features in the draw-down zone is unlikely, though some form of monitoring should ideally take place in the depths of reservoirs, given the limited information about submerged heritage in these depths. Technology and expertise exist that make investigation, monitoring, and conservation possible and practical, through dive investigation and monitoring, remote videography, and side-scan sonar. Data collected in the reservoirs in Scotland that was juxtaposed against data from Egypt and the United States, suggest

that heritage is not inherently at risk in reservoirs, though many of the priorities that have been set in those three case studies were not on the basis of vulnerability, but presumed loss: both to academia and in revenue. Amongst all of the features investigated, earthen features were those that were vulnerable, and in every reservoir in Scotland, evidence of this vulnerability came to the fore. In Egypt, it was the stone monuments that were moved, but the vulnerable mud-brick settlements that were left behind (along with the island as archaeological landscape). As such, steps should be taken to protect those most vulnerable of features, even if it means reassessing how archaeological and heritage management priorities are decided upon, and then changing those priorities to ones that emphasize conservation and real opportunities for knowledge advancement, over nationalistic monumentality, historiography, and tourist potential. These interests should not be entirely ignored or avoided, but they cannot continue to take total precedence over vulnerable features that will be destroyed; even if those vulnerable features are not finance generating.

Policy can play direct role in how submerged heritage is treated and have a direct effect on the long-term prognosis of features. It's direct effect stems from the relationship between policy and archaeological priority, discussed throughout this dissertation. Action to conserve, investigate and record originates both from local people's determination (whether they are professional archaeologists or not) and from policy. To date, local calls for action from local populations in all three case studies has generated few results: the Egyptian government, with the assistance of foreign aid, relocated monuments; St. Thomas was left submerged; and the archaeological features in draw-down zones in Scotland remain in a state of constant

threat, despite calls for attention from local archaeology groups. Therefore, if both submerged heritage and heritage on the brink of submergence are going to be recognized, studied and protected, future actions will need to emerge from holistically written and properly implemented policy. In order to accomplish this, very few changes need to be made within the three case studies discussed in this dissertation. As previous discussion illustrates, international and domestic infrastructure exists in which policy aimed at the protection and monitoring of submerged heritage can be created and seamlessly integrated.

By providing holistic policy recommendations here, leading to the potential creation of a "Reservoir Heritage Monitoring and Protection Scheme" (RHMPs) that can integrate into the current infrastructure, several goals are simultaneously accomplished. First, providing point-by-point policy recommendations, based on the conclusive evidence from data collected from this dissertation's three case studies and after consideration of other relevant pieces of literature, saves the time of politicians and other policy creators, whose priorities are often scattered across many important areas. This policy-based approach may in the long-term prevent a host of dam-related conflicts and contribute to the greater welfare of local or indigenous populations; providing them with the right to stewardship and training in monitoring not only creates jobs and helps promote community identity and peace, but also contributes to a higher moral standard in all practices involved in dam creation. This approach transcends Maslow's hierarchy of needs, supplanting basic needs with societal needs and rights in better accord with the "Universal Declaration of Human Rights". Dam engineers benefit from this approach because they will have the basis for a set of best practice guidelines, lacking up until now, applicable in most

geographic regions of the world. So, too, do archaeologists benefit. The moral compass of rescue archaeology needs to be reset, and considerations of monumentality and the transport of exotic or rare items of foreign archaeological and cultural heritage back to home institutions needs serious review and reconsideration. With policy procedures better in place to prioritize the types of archaeological features that should be surveyed, recorded and excavated, limitations on any treasure or artifact hunting aspect of the foreign archaeology mission are inherently in place. Archaeologists will continue to investigate and explore future reservoir basins, taking into account submerged heritage that already exists, but they may eventually undertake these endeavors in a more holistic way- one that engages local communities and prepares them as the stewards of their own past, rather than as mere figureheads for foreign academic interests and expeditions. Finally, submerged archaeological and cultural resources benefit, because although many types of resource lay submerged in reservoirs at the present, that submergence does not exclude the potential of archaeological and investigative works now. Particularly prioritized should be those features in draw-down zones that have been acknowledged as vulnerable or damaged. Work does not need to commence and conclude in the short periods when yearly reservoir levels are low. Instead, investigative, monitoring and mitigation works can take place year-round, due to archaeology's ability to work underwater.

### **10.1 Policy Recommendations: Introduction of a Reservoir Heritage Monitoring and Protection Scheme**

A Reservoir Heritage Monitoring Protection Scheme (RHMP) is outlined here in the form of policy and overall recommendations, the sum total of which make

up the scheme. This RHMPS suggests a two-fold approach to safeguarding and monitoring heritage, with one set of recommendations for forthcoming dam development projects (i.e. not yet underway) and a similar set of recommendations for underway or completed projects, with provisos for corporate, local and CRM responsibilities. The means for managing submerged heritage in the long-term, without developer funding, is suggested on the basis of community and regional dive clubs (where applicable), and greater attempts at localized training programmes in places where SCUBA is not yet a popular or easily accessible sport. Expanded explanations are provided for each point where necessary.

Forthcoming development considerations:

**1. Prioritization of local population opinions, involvement and stewardship of culturally important sites from the outset of the project, written as policy to ensure compliance.**

Upon the realization of project potential, joint fact-finding missions should be undertaken to engage with as many regional and local stakeholders in areas in and surrounding the reservoir flood basin. These groups will inevitably vary in their interests and concerns, which is why early planning and negotiation with all groups is essential. Providing a comprehensive and well-constructed conservation and regional management plan is critical to the success of the dam building potential. All stakeholders reaching the same understandings of conservation, preservation, timeline of the dam and reservoir construction, and predicted lifespan of the dam and reservoir must occur.

Education of local peoples in the stewardship of their cultural heritage, whether tangible or intangible, is essential. Foreign stewardship, though often well

intentioned, is no substitute for local stewardship, ownership and control of locally owned sites, traditions, and historic or archaeological materials.

**2. Prioritization of recording and analysis of "vulnerable" sites in reservoir flood zone on the basis of: location, construction material, and [local] cultural significance.**

The data gathered through this dissertation, as well as through studies undertaken by the NPS, suggest that there exists a certain class of vulnerable archaeological features, which is based predominantly on those features' locations in reservoirs and the material(s) from which the features are constructed. The features that are most at risk are those that are earthen in nature. This includes earthen mounds, features dug into the soil (e.g. post holes, mottes, and assorted pits), burnt mounds, mud brick structures and other non-affixed, non-chemically hardened, or non-fired earthen features and structures. Features of this variety should serve as the focal point for all initial archaeological and investigative works, and should serve as the primary point for research and conservation agendas, especially those earthen features that are in the reservoir's draw-down zone. Other vulnerable features are those of assorted construction material, but situated in the draw-down zone. Stone, brick and wood will endure submergence much longer than earthen features (though their chemistry may, with time, be altered), but all of these features will suffer from location in the draw-down zone. Other classes of archaeological feature that should form the basis for prioritization are those holding special cultural significance to local people, regardless of material from which they are constructed. Care should be taken to apply conservation measures to this group of features.

Although not investigated in this dissertation, those features that will be located at the spill sluice at the head of the dam (i.e. those areas of earth not within the reservoir but are abutting the dam on the other side of the reservoir) should be carefully managed. This area should undergo excavation regardless of points of known archaeological or cultural heritage, since it will be subjected to regular forces of erosion, abrasion, and construction trampling at all later stages in the dam construction.

**3. The extent of archaeological materials and tangible cultural heritage transported to foreign countries as compensation for foreign archaeological aid must be limited.**

Foreign archaeologists should not remove materials to their home country or institution, but instead to local or regional museums and archives for analysis. Continued permission to analyze materials and author works about them is granted initially with potential for special relationships to form between domestic and foreign institutions on the basis of travelling exhibitions (i.e. inter-museum loans) and cross-cultural rights for academic (investigative) access. If specialist analysis or conservation can only take place at foreign institutions or facilities, arrangements should be made for transportation to the foreign institution, with timelines for the return of materials, subject to long-term conservation and care of those newly treated or analyzed materials.

Archaeological materials should not be used as tender or bartering pieces. Pieces of the past are not monetary units, useful for payment or favour to foreign investigators or expedition teams. Professional archaeologists and institutions receive salary and funding from a variety of donors, grants, federal governments, and

commercial employers, and need not resort to imperialistic demands for heritage assets that do not inherently form a part of their own unique cultural identities.

**4. Lower priority sites and features should receive some *in situ* conservation practices or systems for on-site monitoring of priority features within this demarcation set up.**

Stone, brick or otherwise durable features that are not located in the draw-down zone should, with time permitting, undergo general conservation practices if they are deemed necessary to the long-term survival of the feature. An example of this is the reinforcing work undertaken at Philae before the Aswan Old Dam was erected. More important than conservation works on durable features is setting up a system for monitoring those features in the long-term, especially if questions about durability of the feature or lifespan of the reservoir are in question. Exact location of these features is essential for relocation by dive teams or side-scan sonar. Additional pre-inundation monitoring setup may include the installation of underwater videography systems. Predictions about suspended particulate ratio may provide clues about how conservation and CRM teams should proceed, and whether a system for reducing suspended particulate in areas with video systems installed would prove beneficial to longer term on-screen monitoring. Setting up video systems or other means of long term monitoring will be less expensive to the developer, less time-consuming than a full excavation, and less invasive to the archaeological features.

**5. Long-term community involvement and stewardship is essential.**

Local dive communities can monitor archaeological features where applicable, whether to enhance or enrich dive certification status (PADI qualifications such as scientific diver; survey training aspects of other dive



certifications) or during actual recreational dives. Divers may download and fill out forms about the condition of sites visited from easily accessible database, which will encourage active stewardship of local dive sites that are not the mainstream type of dive sites (i.e. they are not shipwrecks or kelp beds).<sup>84</sup>

Alternative methods of long-term monitoring include occasional diver-based videography of sites, decennial reservoir shore walks organized by regional or local archaeological bodies on a volunteer basis, and side-scan sonar analysis of deeper, reservoir floor features. Boat-related monitoring is also the preferred method of long-term monitoring in places where diver monitoring is not possible or presents too many risks to personal health and safety<sup>85</sup>. Side-scan sonar and magnetometry is used in the harder sciences and by hosting water companies (e.g. Scottish Water) to determine shifts in local ecology and reservoir morphology. Therefore, archaeologists do not need to provide side-scan sonar capabilities in all circumstances but instead can benefit from data collected on behalf of other disciplines.

Completed dam projects:

**1. Prioritization of engaging local people to discuss meaning of dam and reservoir in terms of daily life and changes to lifestyles, landscape and cultural identity.**

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<sup>84</sup> Similar methods of volunteer diver recording and maintenance is common within the dive community, with a programme recently underway in Scotland that encourages local diver participation in marine heritage (the SAMPHIRE programme) as well as the wide variety of environmental monitoring programmes encouraged through the large recreational diver companies (e.g. PADI, SSI, BSAC, ScotSAC). This method of volunteer participation in terrestrial archaeology is also being utilized by SCAPE Trust, in Scotland, to monitor coastlines, as well as by Dr. Ian Ralston in the use of volunteers to monitor and report the conditions about iron age forts in Britain.

<sup>85</sup> For example, diving in Lake Nasser or the Aswan Tailgate Reservoir presents several potential risks to diver health, included attack from Nile crocodile, attack from Nile Carp, or infection by the blood-based parasite, *Schistosomiasis*.

In places where changes to the landscape have occurred or archaeological or cultural heritage has been submerged, follow up discussion should be undertaken to record those changes. Local people should be engaged in discussing the meaning of the dam and reservoir in terms of how it has changed their daily life, and how their cultural identity has been impacted as a result of the project. While this may have less bearing in developed countries (e.g. the UK), the impacts of already completed dam projects may have a substantial and lasting impact on indigenous peoples and their sites of cultural heritage. Attempts at understanding those impacts and the recording of them must be made.

## **2. Organization of archaeological investigative measures in instances of exposed and degrading archaeological features due to the reservoir.**

All of the reservoirs investigated in Scotland showed signs of archaeological features exposed and degrading (or at risk of degrading) through their location in the draw-down zone. In circumstances where archaeological features are exposed through the erosion action of the draw-down zone, attempts should be made at recording and excavating the apparent features. If concerns persist about the condition of features in deeper waters, provisions should be made to enact a series of monitoring events in those areas to detect rates of degradation or redistribution of the site, as well as to investigate potential durability of relevant features for the remaining lifespan of the reservoir. Works can be undertaken by both terrestrial archaeologists and divers. Funds to undertake these works may be available from a variety of sources including: the reservoir/dam manager, the local government agency responsible for heritage management, government or private grants, donation, or through the original dam-funding bodies.

**3. Decennial monitoring works in reservoirs, of which some data can be hosted by other disciplines (i.e. the sciences), and utilized by underwater archaeologists.**

Every decade, monitoring plans should be undertaken, to include general survey of the draw-down zone, and relocation and observation of fully inundated features, with an emphasis on upstanding structures and features that were deemed vulnerable pre-submergence. Decennial monitoring is preferable since El Niño cycles every 2-7 years, irregularly, and solar weather patterns occur on a 9-11 year basis (Aguado et al. 2007). Structuring monitoring checks at ten year intervals ensures that all factors influencing changing weather patterns (which have a direct effect on water level fluctuations and reservoir currents) are taken into account. Yearly water level fluctuations, while damaging to reservoirs in the reservoir's draw-down zone, will not completely degrade most vulnerable features. The fieldwork conducted in this dissertation has displayed the existence of many earthen features beyond the 7-year period between original recording (in Scotland) and the time at which underwater survey and assessment took place. Nevertheless, decennial survey and monitoring will safeguard against instances of severe degradation in the event of features being missed in initial recording phases, as well as safeguard features in deeper locations in reservoirs as these types were not as heavily investigated in this work.

**4. Where applicable, "beyond compliance" funds should be made available by reservoir and dam management companies, with alternative funding coming from government heritage funds, grants and the World Bank.**

Although communities benefit from the supply of freshwater and electricity, dam development companies and then the water suppliers (e.g. Scottish Water, in Scotland) benefit more heavily from the financial investments in the dam. Therefore, it is not unreasonable to suggest that the benefactors of the dam and reservoir provide some means at funding "beyond compliance" mechanisms, through which the long-term monitoring schemes may take place. Long-term conservation costs may also originate from this fund. Where funds do not meet costs of monitoring or conservation works, alternative funding may be available from government heritage funds, special grants, or from the World Bank, in instances where the World Bank funded the initial dam project.

**5. Heritage organizations' support of grassroots heritage investigators (amateur archaeologists) working in areas of submerged archaeological features, to include both dive and terrestrial groups.**

Government agencies that specialize in CRM, whether at the local, regional or national level, should provide support for grassroots heritage investigators, whether these investigators take the form of terrestrial archaeologists or archaeological divers. By supporting community-based works at reservoirs, these agencies display respect for local stewardship and ethics practices. This is in contrast to the commercial archaeology approach, in which agencies contract out archaeological works on the basis of lowest bidding company, resulting in poor archaeological practices, non-local workers, and a relocation of materials and knowledge away from the localized archaeological and cultural resources. Work conducted by the Biggar Archaeology Group is proof that amateur groups are just as rigorous in their applied methodologies and research schemes, in addition to

allowing public (online), free access to all information obtained through their investigations. With agency support other groups with similar missions will improve methodology and practices through time, opportunity and financial support.

**6. Creation of online databases of information about submerged heritage works and what has been submerged in reservoirs on a case-by-case basis (promotes underwater tourism and stewardship, as well as diving surveyors).**

In keeping with CRM best practice standards, all information obtained from submerged archaeological or cultural heritage sites should be made available in open-access or low cost format, especially to locally affected populations. Local museums and displays, as well as open-access websites allow this free exchange of information, and keeps the past accessible and relevant in the lives of those most affected. The creation of online databases or paper-format lists of what types of features or structures have been submerged in a reservoir generates interest in the features. Keeping these records also generates new potential meaning for the sites, as they evolve from sites purely terrestrial, to those submerged. Over time, new meaning and relationships with the features form, whether through folktales, childhood memories, or tangible experiences of divers, tourists, local people, or archaeologists who monitor, survey and record information. Managing records properly promotes underwater tourism and stewardship on a local level, and allows members of the public to engage with the submerged past in new, but still meaningful, ways.

International RHMPS Initiative (UNESCO)

The creation of a RHMPS Initiative under the auspices of UNESCO would only hasten awareness and action in reservoirs, safeguarding already submerged heritage through monitoring, knowledge and stewardship. The RHMPS Initiative would also provide a tangible document and mechanism within UNESCO at which dam developers could look to for best practice guidance. UNESCO cannot legislate for every type of heritage in every part of the world, but organizing mechanisms through which assistance, funding, training and greater awareness are built is integral to the organization's mission. It is the right organization to host such an initiative since it is still through UNESCO that many countries receive dam-building assistance (i.e. in regards to tangible and intangible cultural heritage best practices, archaeological investigation and recording, and education initiatives). Because UNESCO is international and streams materials to a diverse audience, it has the ability to transcend cultural differences and present information in a more objective means than may occur from country to country. Finally, if UNESCO is in a position to provide funding and international assistance to the programmes that make large dams possible, then as the education, science and culture branch of the UN, it must be willing to host an initiative that sees through its projects in a more holistic way. The creation of an international RHMPS Initiative would allow the creation of a new definition of "submerged landscape", transcending traditional underwater archaeological application to landscapes submerged in saltwater environs, to any cultural, archaeological, or historic landscape that is submerged, whether through an act of the weather or humankind. An international RHMPS mechanism is outlined here:

- 1. In order to safeguard heritage from foreign transit (as recompense for investigative, analytic or recording works provided), a preferred method of *in situ* preservation should be undertaken.**

*In situ* preservation must not be mistaken for laziness or a lack of well-constructed research questions or agendas. To allow things to linger *in situ* without good cause does the CRM community no favours, except in instances when it is used as the preferred option as a means to thwart the efforts of looting or commercial enterprises. In this case, *in situ* preservation is the preferred method of conservation, saving in cases of vulnerable sites in draw-down zone, because it safeguards against transit out of that country or region. It also provides incentive to carefully construct research and recording agendas according to the actual vulnerability of features, rather than on the basis of researcher or institution-based interest.

- 2. Seeking to apply protective statuses to submerged heritage in all forms, the designation of "submerged landscape" becomes applicable when a reservoir flood basin and its associated archaeological or cultural resources derive meaning through the landscape that was flooded.**

In this instance, the demarcation and protective status of "submerged landscape" becomes appropriate. Reservoir flood basins that are free of culturally or archaeologically important features need not bear this protective status, and it is possible in cases of very large reservoirs that only designated areas of the reservoir hold this status. Potential applicability of this status includes the town of St. Thomas formerly in Lake Mead, and the original Philae island in Lake Nasser. Other places of potential applicability include the submerged mounds in the Keban Reservoir, and

Ada Kaleh in the Iron Gates Gorge, which demonstrate whole historic and cultural landscapes that have been submerged.

**3. UNESCO should undertake to make comprehensive databases of archaeological and other cultural resources that have been submerged, whether the project was in partnership with it or not.**

UNESCO, in partnership with its member states, may deem it beneficial to the open access of information to form a series of online databases detailing the reservoirs worldwide that contain known instances of submerged heritage, in addition to the nature of that specific type of heritage.

**4. A specialized pair of joint fact finding and dispute settlement mechanisms under the auspices of UNESCO may be established to promote good will dialogue between dam-related stakeholders from early stages in dam planning, and to help ensure best practice guidelines are followed.**

Although UNESCO does not currently oversee any CRM-specific joint fact finding or dispute settlement mechanism at the present, creating these bodies on an *ad hoc* basis would prove useful not only to those stakeholders involved in dialogue or debate, but would contribute the knowledge and experience of negotiations and debates to the wider world stage. By overseeing initial stages of planning, as well as the potential disagreements that may arise, culturally and commercially relevant experiences of the entire process are shared with stakeholders from other projects, allowing stakeholders to learn from the experiences of other projects.

**5. Given UNESCO's propensity for liaising with funding networks on behalf of CRM specialists and foreign archaeology teams, UNESCO may**



**provide a funding network to provide for additional costs associated with monitoring or conservation works.**

The works undertaken as the "International Campaign to Safeguard the Monuments of Nubia" were funded through UNESCO (i.e. its member states) and its liaison with the World Bank.

### Implementation

Although every country hosts a range of heritage-related policies and practices, the scheme proposed here has the potential for implementation into every case study discussed in this dissertation, as well as at the international level. In the USA, a small subsection to the "Moss-Bennett Act," could provide the critical points made, thereby cueing American archaeologists to begin more holistically and rigorously assessing reservoirs across the United States. Some of the work conducted and assembled by Brandt and Hassan (2000) provide the American underpinnings and further evidence to make this a reality in the American CRM sector. Their work may also provide a good launching point for information already assembled about heritage in reservoirs in the USA, although further work is needed. Britain holds two options for implementing the RHMPS: as an appended clause to the "Reservoir Act (Scotland)" or as an individual act, presented by policy specialists at Historic Scotland. With so much evidence of rapidly degrading heritage in draw-down zones in Scottish Reservoirs, and the large number of inundated sites, pushing through such an act may be timely but achievable. Applicability and implementation of the RHMPS is more difficult in Egypt, given her current state of unrest. However, even despite the unrest, actions may be undertaken by the Supreme Council of

Antiquities to apply the tenets of completed construction projects, either as an individual act or through the regulations of building and construction.

## **10.2 Critical Analysis of Work Undertaken**

The works undertaken throughout this dissertation from policy analysis to the underwater fieldwork conducted in reservoirs in Scotland has all been done with the aim of dispelling the myths surrounding archaeological features in reservoirs: the idea that heritage is inherently lost when reservoirs fill. This notion is not true. The data collected and analyzed in this work has shown that while certain types of archaeological features are extremely vulnerable, especially in those areas of reservoirs where there exists a regular fluctuation in water level, there are many other types of features that are generally stable. These stable features, as examples, prove to us that underwater (as in many other types of underwater archaeology) archaeology in a reservoir is as viable a cultural or archaeological resource, deserving of protection, monitoring and study, as those underwater features and landscapes in naturally formed lakes, seas, and oceans. That little policy exists to hasten their protection has twofold meaning: first, that underwater archaeology is still a new enough sub-discipline that all facets of underwater resources have not yet been considered at the political or bureaucratic level; and, to an extent, even without submerged heritage mechanisms in place to consider or promote best practice guidelines, some types of submerged heritage will continue to endure submergence. The outstanding problem is that while some types of submerged heritage will endure that submergence, other types simply will not. Good willed attempts at conserving, recording and relocating features from dams constructed in the past have failed to

stop the degradation of the most vulnerable of features, since monumentality, tourism-driven motivations, and historically rooted ideas about submerged archaeology longevity and prioritization have prevailed.

Submerged heritage does not always mean loss, either to local people or to the academic community, although if there is a loss, it is most deeply felt by local people whose cultural identity, religious practices or lifestyles may depend on access or relationship with those sites or features submerged for some hundred of years (or truly lost through erosion/abrasion). It is toward this consideration that policy needs to intervene and provide long-lasting protection and management of the features it has, through other policy mechanisms, chosen to submerge. That is only right.

What has not been possible to achieve through this work is to attempt to unravel all of the important human and indigenous rights aspects associated with dam development, even though some aspects of the work has hinted at it. Furthermore, the geopolitical regions in which case studies were conducted were both varied and limited. Egypt is currently in a state of political unrest, while both Britain and the USA are politically stable and bureaucratically similar (despite the potential for Scottish independence). The fieldwork conducted in Scotland was also limited on the basis of budgetary constraints, on the abilities of volunteer divers and their recording, photography and objective assessment skills, and the range of sites that could be investigated. However, other aspects of the fieldwork were also limited: photography in some areas of the reservoirs was unexpectedly difficult, due to the season in which dives were undertaken. Drawing and measuring proved easier, but were not the preferred method of recording. The journey made to St. Thomas had its shortcomings as well, with a period of inclement weather, inability to

make a return trip to the town during the period of study, and the self-reliance required on-site. Although fieldwork was originally planned for the Aswan Tailgate Reservoir (despite some of the potential diver-related risks involved), the political unrest in the country and the gender of the author made that ambition an impossible endeavor.

In its political analysis and recommendations, the author attempted to avoid restating elements that seemed too complex for thorough discussion given length limitations. If possible, more attention would have been given to the complex political decisions that were being made at the time of the dams' constructions, although these too seemed too etched in their historic milieu to be rendered of utmost importance and relevance, given the larger bodies of work needing discussed.

The full success of this work is that it was able to bring together policy and archaeology in a way that has so far remained largely unattained as far as reservoirs are concerned. It is hoped that this work may provide the headway into deeper archaeo-political discussions surrounding the greater renewable energy sector, and provide deeply needed best-practice guidelines to which dam developers, and all renewable energy professionals, can look. Dams, policy, cultural heritage, and the wider sector of renewable energy are in the teething stages of their dynamic and sometimes uneasy relationship with each other, but works that bring together all of these elements in a way that neither glorifies archaeology or developers, nor vilifies efforts on any side moves dialogue forward in a meaningful way. It is in this way that real progress is made, both in the development and confidence in new technologies and required means of providing water and energy to burgeoning

populations, but also in archaeology, where old trends, priorities and assumptions must ever be challenged and renewed.

### **10.3 The Future of Archaeology in Reservoirs**

The future of archaeological and cultural heritage in reservoirs looks promising. Data collection and analysis has established that while some types of submerged resources are vulnerable, others are surprisingly durable. This bodes well for what future generations of terrestrial archaeologists may uncover when the lifespans of modern large-dams come to an end. Unfortunately, for those features that are vulnerable, the efforts may be too little, too late. Some efforts at recording eroding features in the reservoirs in Scotland have been made in this work, and terrestrial efforts at recording those most vulnerable features are still being made by amateur groups in this country. Efforts at understanding and recording vulnerable features in Lake Nasser are slower in coming, for reasons both political, religious, and health and safety driven. When the country settles down, efforts in the CRM sector will undoubtedly resume. In the USA, there is already good progress being made to understand some types of submerged heritage, generally made through the "Moss Bennett Act" and NAGPRA, but regardless which act or law it stems from, progress in this sector is a good sign. The USA has yet to undertake the long-term monitoring in all of its reservoirs, potentially an impossibility given the sheer number of reservoirs in total across the country, but efforts at monitoring in Lake Mead provide a sense of optimism about the direction of monitoring and maintenance.

In the case of submerged resources not investigated or discussed at any great length in this dissertation, similar concerns and optimisms hold. Behind the Three Gorges Dam in China, lay a massive submerged landscape with countless recorded and unrecorded archaeological and historic features, many of which will survive the multiple-century flooding brought upon them by the dam. For those vulnerable features in the draw-down zone, one only hopes that researchers and amateur groups in China will race to the eroding shoreline to salvage and record where possible. The possibility of dive-based assessment in the water is unknown at the present. In Japan, the great number of reservoirs sit entirely uninvestigated, and this will form the basis of some of the future research efforts of the author, in an attempt to redefine Japanese underwater archaeology, and provide an underwater reconsideration of the area of Shima, already a sea park.

For those resources that are still above flood levels but in planned reservoir flood basins, holistic and new methods of investigating features, prioritizing salvaged sites, and working with rather than on behalf of governments and local peoples must start sooner rather than later. In this, too, there is hope: in a workshop co-organized by the author, priorities in all aspects of dam development and CRM were discussed, and the entire workshop body (engineers and archaeologists alike) agreed that best-practice guidelines are needed on all sides of the discussion. These best-practices included prioritizing vulnerable sites, expanding our knowledge about longevity of sites in reservoirs, engaging better with (rather than for) local populations, and starting the CRM dialogue at the earliest stages of dam development discussions. The role of policy throughout these discussions was always at the fore: without policy-driven practices and guides, developers (through no ill-will) would not

consider heritage as important a matter as designing and building an efficient dam. Without policy dictating otherwise, archaeology, history and cultural heritage management, as a whole, are relegated again to the roles of 'softer' issues.

## **10.4 Concluding Remarks**

Policy and its immediately apparent and subtler effects on submerged heritage are inextricably interwoven. Without policy to create and enforce best practice guidelines, some forms of damage to a diverse cultural and archaeological heritage are inherently incurred. Coincidentally, the wrong type of policy also contributes to damage, both to cultural heritage and to populations that hold that heritage in importance. What is needed now is for the right type of policy to set into action those best practices that will safeguard the future of submerged heritage around the world: both those sites and features long since submerged in reservoirs, and still terrestrial features that will one day be submerged.

This work concludes with the sentiment that heritage in reservoirs is not inherently at risk of destruction. In some locations in reservoirs, a variety of different types of damage can occur in a relatively short period of time. In other locations in reservoirs, features may, like their marine counterparts, reach equilibrium with their surroundings and be protected from more destructive types of development, vandalism, or weathering. In those deeper areas of reservoirs, features do not suffer the same effects of abrasion or erosion; sedimentation deposited from passing currents protects these features and may eventually form an anaerobic layer, further protecting them. The issues surrounding archaeological features in reservoirs

then, should be concerned less about the physical destruction of features<sup>86</sup>, but rather about the holistic management of those features, a more comprehensive set of policies and practices aimed at managing and mitigating damages, and a change in the way practitioner's think about those features. Less emphasis should be placed on rescue or salvage operations in the pre-flooding phase, and more emphasis placed on local population input, stewardship and long-term monitoring. Domestic and international policy can help to shift this mindset.

The creation of a set of domestic policies that protect submerged heritage through a set of reservoir heritage monitoring and protection scheme is just one way of creating the change needed to safeguard those features. Archaeology, too, must reconsider its role in archaeological salvage operations both domestically and as part of international expeditions. Commercially motivated enterprises, while assuring to institutions, do not provide for the long-term stability of archaeological features, which in turn acts as the Achilles heel to the discipline as a whole. If archaeologists and CRM professionals do not take a stand for more holistically motivated ambitions, that include consideration of the issues of ethical stewardship and prioritization of truly vulnerable features, the types and quality of cultural resources that will emerge in centuries to come will surely remain a legacy damned by our dams.

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<sup>86</sup> except concerning features in the draw-down zone.



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