To: EAHCP Committees

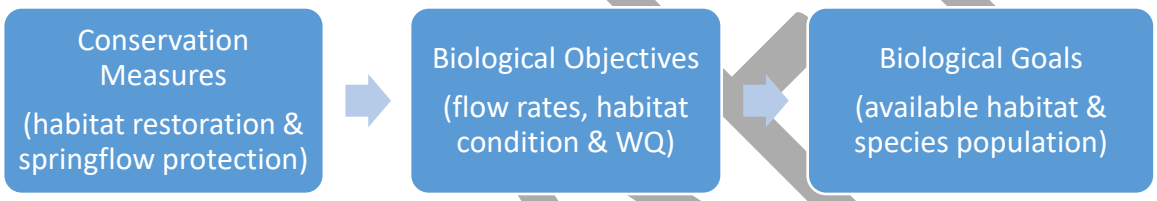
From: Nathan Pence, EAHCP Program Manager

Date: May 11, 2018

Subject: EAHCP Strategic Adaptive Management Process

The EAHCP is quickly approaching the Strategic Adaptive Management Process, which bridges Phase I (2013-2020) of the program to Phase II (2020-2028). **The information contained in this memo is intended to inform all Committee members of the baseline information involved in the process, frame the relevant questions for consideration, identify the decisions to be made by the Committees, and provide a timeline for planning, decision-making and implementation.**

Definitions:



Executive Summary and Introduction

The EAHCP Implementing, Stakeholder, and Science Committees are about to embark on the transition from Phase I to Phase II of the EAHCP, known as the Strategic Adaptive Management Process (SAMP). The primary deliverable from SAMP is the identification of the specific conservation measures (CM) to be implemented during Phase II of the ITP (FMA § 7.6.3). The potential outcomes include:

1. Continuation of Phase I CMs without change
2. Continuation of Phase I CMs with changes or expansion
3. Continuation of Phase I CMs, plus a new Phase II CM(s)
4. Continuation of Phase I CMs with changes, plus a new Phase II CM(s)

The SAMP is formally defined by the Funding and Management Agreement (FMA) and represents a structured review period built into the EAHCP (FMA § 7.14). Specifically, the review is focused on ensuring the EAHCP is meeting its biological objectives (both minimum springflows and habitat). If the EAHCP is meeting these biological objectives, then the current Phase I implementation continues unchanged; if not, then all three Committees will make decisions on addition of our package of Phase II conservation measures to ensure we achieve the biological objectives. There are two primary sources of input that will assist the EAHCP Committees in determining if the biological objectives are met:

1. The EAA modeling team will perform a series of model runs to evaluate whether the springflow protection conservation measures[1] are meeting the minimum springflow objectives (Tables 1 and 2), and
2. The National Academies of Sciences Report #3 will evaluate whether the conservation measures achieve the habitat-oriented biological objectives and thus, the biological goals.

[1] These conservation measures are: (1) the Voluntary Irrigation Suspension Program option under EAHCP § 5.1.2; (2) the Regional Water Conservation Program under EAHCP § 5.1.3; (3) Critical Period Management – Stage V under EAHCP § 5.1.4; and (4) the SAWS ASR Springflow Protection Program under EAHCP § 5.5.

The detailed timeline for SAMP as set out in the FMA and expanded by staff, is outlined in Appendix A. Below is a summary of the milestones:

2018
- Conduct groundwater modeling.
- Receive Report 3 from the National Academy of Sciences.
- Committees make determination: are Biological Objectives meeting the Biological Goals, and are the current Phase I Conservation Measures meeting the Biological Objectives. (EAHCP § 7.13.7)

2019
- Finalize groundwater modeling
- If the Biological Objectives have not been met, Program Manager initiates SAMP.
- Committees make decision on specific conservation measures to be expanded or added.

2020:
- Finalize approach for implementation of additional conservation measures.
- Communicate all decisions to USFWS.
- Begin implementation of additional conservation measures, if required to meet Objectives.

2021
- By March, finalize implementation of additional conservation measures not yet completed in 2020.

Strategic Adaptive Management Process

SAMP is the transition from Phase I (2013-2020) to Phase II (2020-2028) of the EAHCP and associated Incidental Take Permit. Specifically, the decisions made through (SAMP) relate to the selection of Conservation Measures for Phase II of the EAHCP implementation. In other words, SAMP is defined as the formal use of routine or non-routine AMP (FMA § 7), as the EAHCP transitions from Phase I to Phase II, to answer the following questions (FMA § 7.13.7):

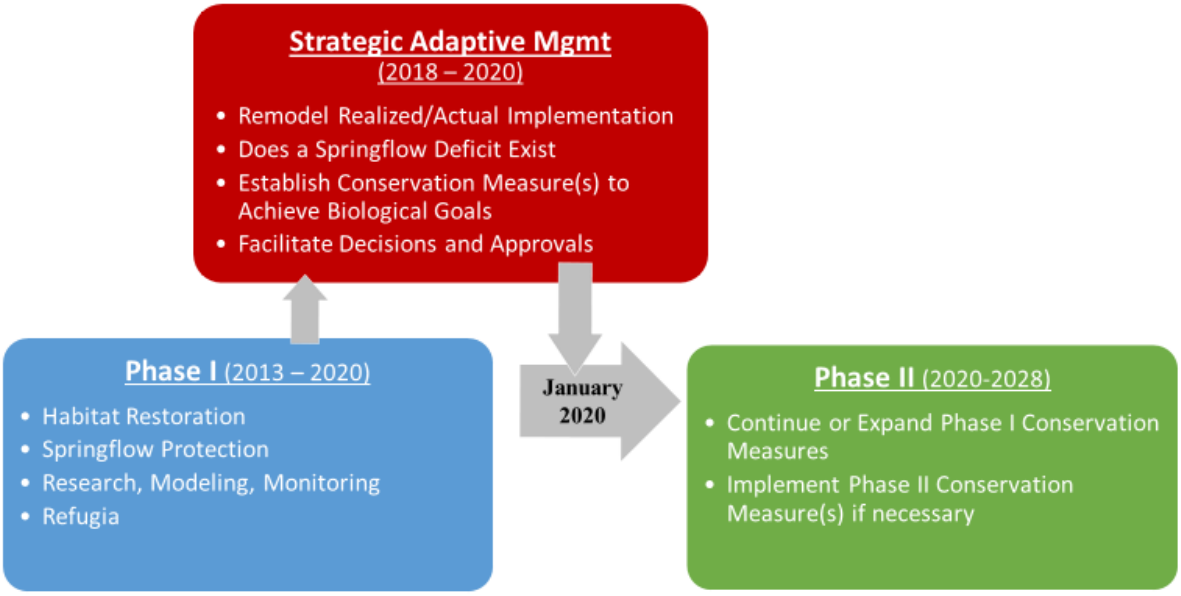
- **Are any of the current Biological Objectives not necessary to meet the Biological Goals?**
- **Are the Biological objectives adequate to meet the Biological Goals?**
- **Are any of the current Phase I Conservation Measures not necessary to meeting the Biological Objectives?**
- **Are the Phase I Conservation Measures meeting the Biological Objectives?**

As illustrated in Figure 1, during the transition between Phase I and Phase II, in addition to the questions presented immediately above, the SAMP specifically must be able to answer the following questions:

1. Does a springflow shortfall exist at Comal Springs or San Marcos Springs? If so, what would be an appropriate Phase II Conservation Measure(s) to make up the springflow deficit?
2. Do the Phase I Conservation Measures achieve the quantity and quality of habitat required?

To answer these questions, the EAHCP Committees will need to utilize the information and data produced by the Hydrologic Model, EAHCP monitoring programs and the National Academy of Sciences Report 3.

Figure 1: EAHCP Strategic Adaptive Management Conceptual Workflow



Hydrologic Model

During the EARIP process, the Science Subcommittee established minimum springflows that are required to maintain sufficient areal coverage of suitable aquatic vegetation and related habitat so that any incidental take of the Covered Species that may occur during a repeat of the Drought of Record (DOR) (Table 1 and Table 2) would not appreciably reduce the likelihood of the survival and recovery of the species in the wild once the DOR was over.[2] HDR was then engaged to conduct initial predictive hydrological modeling, that established the amount of springflow protection provided by the EAHCP Springflow Protection CMs. These springflow measures were designed and implemented with the goal of achieving the required minimum springflows. At the conclusion of the EARIP planning process, the Steering Committee decided to move forward with the submittal an application for an incidental take permit to USFWS and implementation of the EAHCP, even though they were aware that the EAHCP, as modeled by HDR, did not quiet achieve the required minimum springflows represented in Table 1 and Table 2 during a repeat of the DOR. Tables 3 and 4 below, identify the deficits in required minimum springflows as originally modeled by HDR during the EARIP process. The EARIP Steering Committee chose to move forward despite awareness of this modeled shortfall, as they knew at some point in Phase I, there would be a revised MODFLOW model from EAA that would provide a more refined modeled result. Moreover, the Steering Committee wanted to wait and see how the implementation of the Springflow Protection CMs actually came together (i.e. specific geographic locations of forbearance and

[2] The actual permitting criteria for the issuance of the EAHCP ITP was that any incidental take that may occur including during a repeat of the Drought of Record, resulting from the Covered Activities would "not appreciably reduce the likelihood of the survival and recovery of the [Covered S]pecies in the wild" once the Drought of Record was over. *See* 16 U.S.C. § 1539(a)(2)(B)(iv); and 50 C.F.R. §§ 17.22(b)(2)(D); 17.32(b)(2)(D). Additionally, any such incidental take could not "jeopardize the continued existence of any [of the Covered S]pecies or result in the destruction or adverse modification of [the designated critical] habitat of such species …" *See* 16 U.S.C. § 1536(a)(2); and 50 C.F.R. § 402.14(h)(3). As defined, the "jeopardize the continued existence of" is substantially similar to the "appreciably reduction" standard for ITP issuance. 50 C.F.R. § 402.02. *See also* EAHCP § 4.0.

actual acft enrolled). In short, the Steering Committee wanted to better quantify the springflow levels achieved by the EAHCP Springflow Protection CMs and ensure successful implementation of the CMs, before expending additional resources to make up modeled springflow deficits that may or may not actually exist.

The revised MODFLOW model (2017) will be used to model the amount of springflow protection (daily (1947-1958) and long-term (1947-2000)) provided by Springflow Protection CMs during a repeat of the DOR. Should the amount of modeled springflow be less than the required minimum springflows by the EAHCP as set out in Tables 1 and 2, and the deficits in Tables 3 are not made up, then the model will be used to establish the amount of additional springflow protection provided by expanded Phase I CMs and/or new Phase II CMs. Specifically, the following model runs will be made with the updated MODFLOW model (2017), as needed:

1. EARIP Daily Minimum: 1947-1960 copy of the HDR bottom up model runs using the Edwards updated MODFLOW model.
    a. The purpose of this is to examine minimum daily springflows at Comal and San Marcos through the DOR
    b. This is completed per Liu et al. 2017 (ASR AMP)

2. EARIP Long-term Average: 1947-2000 copy of the HDR bottom up model runs using the Edwards updated MODFLOW model.
    a. The purpose of this is to examine long term average springflows at Comal and San Marcos over a minimum 50-year modeling period including the DOR

3. EAHCP SAMP Daily Minimums: 1947-1958 with actual to date implementation of springflow protection conservation measures.
    a. The purpose of this is to examine minimum daily springflows at Comal and San Marcos through DOR with our current Phase I measures as implemented. This model run will be used to determine if additional conservation measures may be needed to meet the Biological Objectives. Differences between model run 1 (described above) and this run include:
        i. VISPO – geographical distribution of forbearance and actual volume enrolled.
        ii. ASR – geographical distribution of EAA forbearance; new two tier system and trigger.
        iii. RWC – geographical distribution of forbearance.

4. EAHCP SAMP Long-term Average: 1947-2000 with actual to date implementation of springflow protection conservation measures.
    a. This is the same run as for #3 above, with longer time period

5. Phase I CMs + Phase II CM(s) *(if needed to achieve minimum springflows)*[3]

[3] The Phase II CMs referenced here could be changes/expansion of Phase I CMs, or the addition of new CMs unrelated to the current Phase I CMs.

Table 1: Comal Springs Biological Objectives[4]

Long-term Average (50 year; 1947-2000)	225cfs
Minimum Daily Average (1947-1960) - not to exceed 6 months in duration; followed by 3 months of 80cfs	30cfs

Table 2: San Marcos Springs Biological Objectives[5]

Long-term average (50 years; 1947-2000)	140cfs
Minimum Daily Average (1947-1960) - not to exceed 6 months in duration; followed by 3 months of 80cfs	45cfs

Table 3: Comal Springs Modeled Springflow compared to Biological Objective Springflows

	Required Minimum Springflows	Springflow Achieved	Deficit
Long-term	225	196[6]	29
Daily	30	27[6,7] / 29.7[8]	3 / .03

Table 4: San Marcos Springs Modeled Springflow compared to Biological Objective Springflows

	Required Minimum Springflows	Springflow Achieved	Deficit
Long-term	140	155[9]	-
Daily	45	51[9] / 48[8]	-

National Academy of Sciences Report 3

For the most part, the EAHCP habitat restoration efforts that have occurred since the inception of the ITP have been successful. Moreover, there have not been any observed impairments to surface water quality that have arisen. Therefore, it is anticipated that our habitat related and water quality related conservation measures are achieving our biological goals. Thus, the focus for SAMP has been springflow centric. However, the NAS Report 3 will look at both springflow protection and habitat restoration. To conduct their analysis, NAS will use the information learned during the 6 EAA NAS collaborative meetings held from 2013-2018 and the EAHCP scientific record that has been continually provided to NAS as it was developed.

Depending on comments received by NAS in Report 3, a habitat quality/quantity component to SAMP may be required. Specifically, I could potentially foresee NAS providing comments on our submerged aquatic vegetation restoration and riparian restoration conservation measures.

[4] EAHCP Table 4-2
[5] EAHCP Table 4-13
[6] EAHCP Table 4-30
[7] Minimum flow for only 2 months of DOR
[8] 2017 Updated MODFLOW Model Output
[9] EAHCP Table 4-52

As specified in their contract, NAS will determine the following: (NAS contract 2014 and FMA §7.13.7)

- Whether the biological objectives are likely to achieve the biological goals for all Covered Species, and if not, how might flow rates, amounts of habitat and water quality objectives be amended to achieve the biological goals.
- Whether the Phase I conservation measures are adequate to meet the biological objectives, if not, does the presumptive Phase II conservation measure achieve the biological objectives.
- If Phase I conservation measures nor Phase II conservation measure meet the biological objectives, NAS will determine the extent of the deficit.
- Whether any biological objectives for any Covered Species or Phase I conservation measures are not needed to achieve the Biological Goals.

Simply put, it is anticipated that the NAS Report 3 will evaluate our Springflow Protection Measures and Habitat Restoration, and ultimately determine if they achieve the EAHCP's required minimum springflows and habitat quantity/quality.

As the Report has yet to be received and it is unknown what if any issues will be identified, it is hard to plan for specific incorporation of the Report results into the SAMP process at this time. However, it is a given, that information in the Report will be utilized and incorporated in some manner. In past years, when NAS Reports have been submitted to the EAHCP process, workgroups have been used to evaluate and incorporate NAS recommendations into the overall EAHCP effort to the extent appropriate. As this Report is so important and the main reason NAS was engaged, at this point staff plans to utilize the Implementing, Stakeholder and Science Committees in the role of the previous workgroups to review and assess this report. Thus, presenting all relevant information in the Report to all appropriate Committees.

Ecological Model

The EcoModel was built specifically to provide a predictive tool to "evaluate potential adverse ecological effects from Covered Activities and to the extent that such effects are determined to occur, to quantify their magnitude." (EAHCP § 6.3.3). In so doing, the model results would be used to "develop alternative approaches or possible mitigation strategies, if necessary." (EAHCP § 6.3.3). The EcoModel has been run to affirm whether the incidental take of the Fountain Darter during a repeat of the DOR would appreciably reduce the likelihood of the survival and recovery of the Covered Species in the wild once the DOR was over, if the Conservation Measures, and specifically the Springflow Protection CMs, have been fully implemented. This model run was performed by BIOWEST as part of their EcoModel contract with EAA; and the results were that the incidental take of Fountain Darter during a repeat of the DOR with mitigation fully in place did not appreciably reduce their likelihood of survival and recovery in the wild when drought conditions ended. Therefore, no additional work with the EcoModel is required for SAMP.

Springflow Protection Phase II Conservation Measure(s), if Needed

The purpose of the Phase II CMs, either through an expanded Phase I CM(s) or a new Phase II CM(s), would be to ensure the modeled achievement of the springflow-related Biological Objectives. Specifically, an additional or expanded springflow protection CM may be needed to achieve the continuous minimum springflows set by the EAHCP in Tables 1 and 2 and makeup the deficits represented in Table 3. The EAHCP and FMA give the Stakeholder Committee and Implementing Committee the ability to choose and design that CM(s). Should an additional CM be needed but the Committees cannot agree upon what the CM would be or how to best implement a new CM, the EAHCP defaults to expanded use of the SAWS ASR (EAHCP § 5.5.2: Phase II Expanded Use of SAWS ASR and Water Resources Integration Program Pipeline). Below is a brief description of the Expanded ASR and a listing of potential alternative Phase II CMs to achieve the continuous minimum springflows, *if needed*.

Presumptive Phase II CM – Expanded Use of SAWS ASR (EAHCP § 5.5.2)
The presumptive action for Phase II of the HCP, if needed, involves the use of the SAWS ASR with the expanded Water Resources Integrated Pipeline (WRIP) that is now operational. The WRIP consists of approximately 45 miles of water transmission pipeline and a pump station that conveys water from the SAWS ASR, Carrizo, and Brackish Desalination programs located at the Twin Oaks Facility property in south Bexar County to new and existing facilities in western and northwestern Bexar County. The WRIP links the existing facilities and new water supplies located at the ASR site in southern Bexar County with the southwestern and western portions of San Antonio.

SAWS' ability to expand the use of the ASR as a presumptive Phase II measure, if required, assumes that: (1) no additional water beyond that required for the Phase I use of the ASR will need to be stored; (2) the total amount of water to be returned from the ASR over the term of the permit will not exceed 126,000 ac-ft during the drought and 46,300 ac-ft in the worst year; and (3) no more than 40 percent of the capacity of the WRIP distribution system will be utilized at any time for HCP purposes.

The additional springflow benefit from expanded ASR would come from management and timing of recovery, rather than additional water storage or forbearance.

Potential Alternatives to the Presumptive Phase II CM
At this point, based on preliminary modeling conducting during ASR AMP, it is likely that if additional springflow protection is needed, it will not need to be as grand in scale as expanded use of the ASR. Seeking cheaper and smaller in scale Phase II CMs or a small increase in an already existing Phase I CM, seem to be a more reasonable approach.

Feasible Alternative Phase II CMs

1. Additional VISPO forbearance
2. Additional ASR forbearance by EAA
3. ASR Pooling by EAA for credited forbearance
4. Precipitation Enhancement by EAA

Funding
Strategic Adaptive Management planning process funding: In every budget year, the Program Manager has a budget related to professional contracting services and adaptive management. In years 2018, 2019 and 2020, the portion of that budget not already committed, would be earmarked to pay for any costs associated with SAMP. Anticipated expenditures include: 1) documentation of SAMP and production of a summary report, 2) facilitator services if needed, and 3) 3rd party review if needed.

Phase II Conservation Measure funding (EAHCP § 7.2): It is important to remember that a Phase II CM may or may not be needed. Because of this, the original EARIP Steering Committee did not set a budget or revenue source for a Phase II CM. If the presumptive Phase II CM is implemented, it is anticipated that no significant additional cost will be associated, as ASR is already included in Phase I. However, there could be additional cost if a CM other than the presumptive use of ASR is implemented, and funding will have to be identified at that time. *The most likely funding source would be the use of existing EAHCP funding, by utilizing savings or transferring costs between CMs. Currently, there is no identified funding for Phase II conservation measures*.

Summary and Recommendations
Over the next two years, with important decisions to make in 2018, the EAHCP will transition from Phase I to Phase II. Modeling will be used to determine if the daily and long-term minimum continuous springflows have been met by the current springflow protection measures. If a Springflow deficit does exist, it is likely to be in the range of only a couple of cfs. Therefore, the Committees should think simple

and cost effective when selecting additional mitigation to achieve springflow targets. Point being, we probably do not need a brand new, large scale, springflow protection measure. But rather, probably only need to add acft to an existing forbearance program or something else small in scale, if at all.

The National Academy of Sciences will provide us input to our habitat restoration measures and we should remain open minded and flexible until the NAS report is received (Fall 2018). It is possible that the focus of these recommendations will be focused on aquatic vegetation, a subject that EAHCP staff and permittees are already working on.

For the purpose of transparency and the administrative record, I would recommend that the non-routine AMP process as described in EAHCP § 7.12-7.14 be followed for any changes in the conservation measures related to SAMP, regardless of magnitude or simplicity. While the FMA does allow for the use of Routine Adaptive Management in the SAMP process, due to the level of complexity, interest and emotion, I believe that being as transparent and inclusive as possible, is the best path forward. Unless stakeholders voice opposing opinion to this approach, this is how I intend to proceed.

Lastly, I believe that we should engage a consultant, as early in 2018 as possible, to document the SAMP process for communication to USFWS and the administrative record and also, have the contractor prepare a standalone exec summary to communicate SAMP decisions to all interested parties.

Appendix A –Timeline for the EAHCP Strategic Adaptive Management Process

Year	Action	Comment
2017		
	EAA finalized updated MODFLOW model	Reviewed by GWMAP and NAS
	Committees attended Ecological Model Workshop	Results of the EcoModel Fountain Darter survival were presented to Committees in July 2017
	Committees reviewed rerun of "Bottom Up Package" from updated MODFLOW model.	Joint meeting held in December 2017
	Science Committee reviewed Scientific Record	Done continuously from 2013-2018
	Program Manager provided Scientific Record to NAS	Done continuously from 2013-2018
2018		
	EAA conducts SAMP hydro modeling	
	Program Manager provides any remaining scientific information to NAS	Fulfilling NAS data, info and report requests
	NAS delivers Report #3 to Program Manager	September 30
	Committees review NAS Report #3 conclusions and SAMP hydro modeling	October – December
	Committees determine the following: • If Biological objectives are or are not adequate to meet the Biological Goals • If phase I Conservation Measures are or are not meeting the Biological Objectives	December 20 Joint meeting of Committees
2019		
	Implementing Committee directs Program Manager to initiate SAMP proposal to establish Phase II Conservation Measures	By January 2019, if Phase I Conservation Measures are determined to not be adequate to meet the Biological Objectives.
	Implementing Committee directs Program Manager to initiate SAMP proposal to change Biological Objectives	If Biological Objectives are determined not to be adequate to meet the Biological Goals. (No date specified in the FMA)
	Science Committee to meet and consider SAMP proposal(s) and draft recommendation to the Stakeholder Committee	
	Stakeholder Committee to review Science Committee report, consider SAMP proposal(s) and draft recommendation to IC	
	Implementing Committee to meet to consider the SH report on SAMP proposal(s)	
	PM completes Phase II Work Plan	March 1
	Committees make final decision to implement Phase II conservation measure	if no decision is made, default is the Presumptive Phase II ASR
2020 & 2021		
	Implement Phase II Conservation Measure(s) by March 18, 2021.	