



Edwards Aquifer Habitat Conservation Plan

Comprehensive Phase II Work Plan

- Draft -

January 24, 2019

COMPREHENSIVE PHASE II WORK PLAN

Section 4.3 of the Funding and Management Agreement requires the Implementing Committee to develop and approve by March 1, 2019, a Comprehensive Phase II Work Plan (the “Comprehensive Plan”). The Comprehensive Plan must include descriptions, schedules, and cost estimates for ongoing Phase I Conservation Measures, Phase II Conservation Measures, and all Program activities conducted or managed by the Parties and Program Manager that are to be funded from the EAHCP program Account for the Phase II period from January 1, 2020 until the expiration of the Permit. This document is intended to satisfy that requirement. The description, schedules, and cost estimates contained herein are taken largely from Chapters 5, 6, and 7 of the Edwards Aquifer Habitat Conservation Plan (“EAHCP”). The description of the measures is not intended to reiterate all details in the EAHCP. To the extent this Comprehensive Plan conflicts with the EAHCP, the EAHCP controls.

I. Conservation Measures

A. Edwards Aquifer Authority

1. San Marcos Aquatic Resources Center and Uvalde National Fish Hatchery– Refugia (§ 5.1.1)

Edwards Aquifer Authority (EAA) will continue to support and coordinate the work of the USFWS operation and maintenance of a series of off-site refugia at the San Marcos Aquatic Resources Center and the Uvalde National Fish Hatchery. As constructed in contract 16-822-HCP between the EAA and USFWS, a series of refugia will preserve the capacity for these species to be re-established in the event of the loss of population due to a catastrophic event such as the unexpected loss of springflow or a chemical spill.

EAA’s support of the refugia will augment the existing financial and physical resources of these facilities, and provide resources for appropriate research activities, as necessary, to house and protect adequate populations of Covered Species and expanded knowledge of their biology, life histories, and effective reintroduction techniques.

The use of this support is limited to the Covered Species in the EAHCP.

1 **2. Voluntary Irrigation Suspension Program Option (§ 5.1.2)**
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3 The Voluntary Irrigation Suspension Program Option (VISPO) program is intended to minimize and
4 mitigate the impacts of incidental take from low springflows by suspending the withdrawal of Aquifer
5 water for irrigation purposes during drought. This measure will require EAA irrigation permit-holders who
6 voluntarily participate in the program to suspend the use of Aquifer water for irrigation purposes during
7 drought to maintain springflow.

8
9 The volume goal for the VISPO program is to remove 40,000 ac-ft/yr from pumping during periods of
10 drought.

11
12 If an irrigation permit-holder desires to enroll less than its full permitted volume, their withdrawals may
13 be monitored by real time automated meters installed by the EAA.

14 The suspension of pumping by the participants in the program will be triggered if the J-17 index well in
15 Bexar County is at or below 635 ft-MSL on the annual trigger date of October 1.

16
17 Historically, irrigators were offered the option of committing to the program for either five- or ten-year
18 programs. In Phase II, only five-year options will be offered. The following payment structure was offered
19 historically:

20
21 **Five-year program:**

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- 23 • A standby fee of \$50/acre-foot that increases 1.5 percent per year will be paid to the enrollee
24 every year of the term, regardless of Aquifer conditions; and
- 25
- 26 • A fee of \$150/acre-foot that increases 1.5 percent per year will be paid for each year when
27 temporary pumping suspensions are required.
- 28

29 **Ten-year program:**

- 30
- 31 • A standby fee of \$57.50/acre-foot for years 1-5 and \$70.20/acre-foot for years 6-10 will be paid
32 to the enrollee every year of the term, regardless of Aquifer conditions; and

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- A fee of \$172.50/acre-foot for years 1-5 and \$210.60 for years 6-10 will be paid for each year when temporary pumping suspensions are required.

In 2018, the EAHCP was clarified to reflect that future VISPO payments will be flexible and based on market conditions. Therefore, for Phase II, the five-year agreements will contain the following payment schedule (which will not include a price escalator):

- A standby fee of \$54/acre-foot per year will be paid to the enrollee every year of the term, regardless of Aquifer conditions; and
- A fee of \$160/acre-foot per year will be paid for each year when temporary pumping suspensions are required.

3. Regional Water Conservation Program (§ 5.1.3)

The Regional Water Conservation Program has been fully implemented through agreements with the San Antonio Water System, the City of San Marcos, the City of New Braunfels, and the City of Uvalde. No additional agreements are anticipated during Phase II.

4. Critical Period Management – Stage V (§ 5.1.4)

The EAA’s Critical Period Management Program includes an emergency Stage V reduction of 44 percent applicable in both the San Antonio and Uvalde pools. For the San Antonio Pool, Stage V is triggered by a combination of monthly average J-17 levels below 625 feet or springflows of either 45 cfs based on a ten-day rolling average at Comal Springs or 40 cfs based on a three-day rolling average. The Uvalde Pool would trigger Stage V using the Uvalde County Index Well (J-27) water level of 840 ft-MSL.

5. Expanded Water Quality Monitoring (§ 5.7.2)

1 The EAA will continue to manage and oversee the expanded monitoring of water quality around Landa
2 Lake and the Comal River, and Spring Lake and the San Marcos River. Presently, the Water Quality
3 Monitoring program contains the following components:

- 4
- 5 • Stormwater runoff sampling
- 6 • Surface water passive diffusive sampling
- 7 • Fish tissue sampling
- 8 • Real-time water quality sampling
- 9

10 **6. Recharge Monitoring (§ 6.2.3)**

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12 In accordance to Phase I efforts, the EAA will continue to measure the amount of water (in ac-ft)
13 recharging the Edwards Aquifer in the area described in Section 1.2 of this Comprehensive Plan. The EAA
14 maintains partnership with the U.S Geological Survey to collect and provide recharge estimates from
15 major drainage basins with streams that flow to the Edwards Aquifer. EAA will publish this measurement
16 no later than June 1st of each year for the purposes of guiding the activities in Section 5.5.1 of the EAHCP.
17 EAA will continue to maintain this information for an appropriate publication.

18 19 20 **7. Biological Monitoring (§ 6.3.1)**

21
22 A comprehensive biological monitoring plan (Variable Flow Study) was established by the EAA in 2000 to
23 gather baseline and critical period data to fill important gaps in the ecological condition of the Comal and
24 San Marcos springs and river ecosystems. The EAA will continue this comprehensive sampling plan for the
25 term of the Incidental Take Permit and provide a means of monitoring changes to habitat availability and
26 the population abundance of the Covered Species that may result from Covered Activities. Presently, the
27 Biological Monitoring program contains the following components:

- 28
- 29 • Aquatic vegetation mapping for select reaches
- 30 • Fountain darter sampling
- 31 • San Marcos salamander sampling

- Texas wild-rice physical observations and annual mapping
- Comal Springs riffle beetle monitoring
- Comal invertebrate sampling
- Comal Springs salamander sampling
- Invasive species monitoring

Monitoring may increase in magnitude, including increased frequency and number of parameters examined, as discharge falls to specific levels.

In addition to long-term monitoring efforts that increase intensity in response to the specified trigger events, a critical period monitoring component is incorporated into the Biological Monitoring Program that initiates full-scale sample efforts at specified trigger levels.

The scope of the Biological Monitoring Program can be modified on a yearly basis, as provided in the FMA with agreement with the USFWS.

The National Academies of Sciences' Consensus report was unable to determine whether riparian management related conservation measures will contribute to achieving the biological objectives of the Comal Springs riffle beetle. This finding was directly related to the lack of quantitative population monitoring undertaken as part of the Biological Monitoring Program. In 2018, the EAHCP formed a Work Group to examine the methodology surrounding the CSRB biological monitoring in addition to other CSRB management issues. The Work Group is anticipated to conclude in 2019, and the final product will likely result in changes to the monitoring methodology of the CSRB conducted during Biological Monitoring surveys.

8. Coal Tar Sealants (§ 5.7.6)

The EAA will continue to regulate the use of coal tar sealants in Comal and Hays counties as directed by Chapter H of the EAA rules.

B. City of New Braunfels

1 **1. Flow-Split Management in the Old and New Channel (§ 5.2.1)**

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3 City of New Braunfels staff will continue to manage the valves and culverts to the Old Channel and New
4 Channel of the Comal River for the protection of existing and restored native aquatic vegetation that was
5 established during Phase I. Additionally, staff will continue to monitor real-time streamflow conditions at
6 USGS gauges in the Comal River system and adjust the flow-control gates to meet streamflow targets. A
7 flow-split management schedule of the Old and New Channels is provided in Table 5-3 of the *Submerged*
8 *Aquatic Vegetation Analysis and Recommendations Report* (BIO-WEST, Watershed Systems Group, Inc,
9 2016). Maintenance activities to exercise the system will be conducted, as necessary, to ensure operability
10 of the flow-control gate. Floating vegetation will be dislodged from the intake structure, as necessary, and
11 is managed and funded under task § 5.2.10 Litter and Floating Vegetation Management of the EAHCP.

12
13 **2. Native Aquatic Vegetation Restoration and Maintenance (§§**
14 **5.2.2; 6.3.4.3)**

15
16 Phase II implementation of native aquatic vegetation restoration within key reaches of the Comal River
17 will continue to include planting native vegetation in unoccupied areas and in areas previously occupied
18 by non-native aquatic vegetation, with the latter preceded by non-native vegetation removal. Adaptive
19 management of submerged aquatic vegetation provided methodologies and specific planting goals to
20 achieve restoration within the Comal River (BIO-WEST, Watershed Systems Group, Inc, 2016).

21
22 The quantity and type of native aquatic vegetation selected for restorative cultivation is provided in Table
23 5-3 of the *Submerged Aquatic Vegetation Analysis and Recommendations Report* (BIO-WEST, Watershed
24 Systems Group, Inc, 2016). To sustain the restored native aquatic vegetation within the Comal system,
25 the City of New Braunfels will continue to conduct yearly maintenance of restoration sites in Landa Lake
26 and the Old Channel.

27
28 City of New Braunfels staff will continue to monitor and maintain planted stands of native aquatic
29 vegetation. Temporal monitoring includes a quantitative measurement system to assess whether
30 plantings are increasing, decreasing, or remaining stable. Additionally, intensive non-native aquatic
31 vegetation removal in the adjacent areas will continue to be implemented until the native vegetation is

1 well-established. This includes additional activities following natural disturbances such as floods, periods
2 of limited recharge, and/or herbivory, as well as anthropogenic disturbances such as recreation or
3 vandalism. Anytime a disturbance is observed, the monitoring and maintenance schedule will be modified
4 temporarily to provide stability for the native vegetation re-establishment.

5
6 **3. Management of Public Recreational Use of Comal Springs and**
7 **River Ecosystems (§ 5.2.3)**
8

9 Phase II efforts to minimize and mitigate the impacts of recreation will continue to include the
10 management of recreational use of the Comal Springs and Comal River ecosystem by the City of New
11 Braunfels through two methods:

- 12
- 13 1) The City of New Braunfels will not reduce current protections provided by City Ordinance or Policy
14 and will continue to enforce local regulations, including:
 - 15 a. Limiting recreation on Landa Lake to Paddle Boats;
 - 16 b. Prohibiting recreational access to the Spring Runs in Landa Park and to the
17 Wading Pool in Spring Run 2; and,
 - 18 c. Prohibiting on water recreation on the Old Channel; with the exception of
19 Schlitterbahn operations within its present location.
20
 - 21 2) Pursuant to Section 9.2 of the IA, the City of New Braunfels will issue, on a volunteer basis,
22 Certificates of Inclusion (COIs) to those commercial outfitting businesses that facilitate
23 recreational activities on the Comal River (Outfitters) that comply with the requirements of the
24 COI program established in this section.
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27 **4. Decaying Vegetation Removal and Dissolved Oxygen**
28 **Management (§ 5.2.4)**
29

30 In 2017, the City of New Braunfels adopted the *Landa Lake and Dissolved Oxygen Management Plan* to
31 be implemented during low-flow conditions (<100cfs) and/or when dissolved oxygen data indicates a

1 potential threat to fountain darter populations (AquaStrategies, BIO-WEST, 2017). Dissolved oxygen
2 management strategies include continuous monitoring of DO concentrations during low-flow conditions
3 and displacement and/ or removal of decaying vegetation and algal mats within Landa Lake. During low-
4 flow conditions, nine additional DO sensors will be installed throughout Landa Lake, Upper Spring Run,
5 Old Channel ERPA and near Spring Island to collect continuous DO data. Additionally, floating vegetation,
6 decaying vegetation and algal mats will be removed, as necessary, to prevent vegetation impacts on
7 fountain darter habitat.

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9 **5. Control of Harmful Non-Native Animal Species (§ 5.2.5)**

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11 In accordance to Phase I efforts, the City of New Braunfels will continue to implement various methods of
12 removal to reduce and control non-native animal species populations within the Comal River system on
13 an annual basis. Methods of removal include gill nets, fyke nets, spearfishing and box traps.

14

15 The targeted non-native animal species include, but are not limited to, the suckermouth catfish, tilapia,
16 nutria and Ramshorn snail.

17

18 Routine biological monitoring will be conducted by EAA and EAHCP contractors (§ 6.3.1) to monitor and
19 assess the distribution of new or existing harmful non-native and invasive species. If a threat is identified,
20 EAHCP staff will work with the contractor to identify areas of concern and potential methods for removal.

21

22 **6. Monitoring and Reduction of Gill Parasites (§ 5.2.6)**

23

24 Research indicates that gill parasites (*C. formosanus*) are not a significant threat to fountain darter
25 populations (BIO-WEST, 2017). Pursuant to the EAHCP, the City of New Braunfels will continue to conduct
26 water column concentration monitoring of the gill parasite (*C. formosanus*) cercariae within the Comal
27 River system. During low-flow conditions (<100 cfs), water column gill parasite cercariae monitoring will
28 be implemented at three established transect sampling locations within Landa Lake, the Old Channel and
29 New Channel.

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1 **7. Prohibition of Hazardous Materials Transport Across the**
2 **Comal River and Its Tributaries (§ 5.2.7)**

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4 In accordance to Phase I efforts, the City of New Braunfels will continue to restrict the transportation of
5 hazardous materials on routes that cross the Comal River and its tributaries. This effort may include
6 legislation, City of New Braunfels ordinances, additional signage, and TxDOT approval.
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8 **8. Native Riparian Habitat Restoration (Comal Springs riffle**
9 **beetle) (§ 5.2.8)**

10
11 The City of New Braunfels will continue to restore native riparian zones, where appropriate, to benefit the
12 Comal Springs riffle beetle by increasing the amount of usable habitat and food sources (*i.e.*, root
13 structures and associated biofilms). Methods for riparian zone establishment includes the removal of non-
14 natives and replanting of native vegetation representative of a healthy, functioning riparian zone. Trees
15 and other riparian vegetation with extensive root systems are given preference to create maximum riffle
16 beetle habitat. In coordination with TPWD, fine sediment covering springs will also be removed, as
17 necessary. The riparian zones will be monitored (at least annually) for continued success and removal of
18 reestablished non-native vegetation.
19

20 Additionally, the City of New Braunfels will continue to monitor and maintain riparian habitat zones
21 established during Phase I and work to establish new riparian habitat zones within the Comal watershed
22 for the benefit of the Comal Springs riffle beetle.
23

24 **9. Reduction of Non-Native Species Introduction and Live Bait**
25 **Prohibition (§ 5.2.9)**

26
27 In accordance to Phase I efforts, the City of New Braunfels will continue to undertake measures to stop or
28 substantially reduce the introduction of non-native species from aquarium dumps and prohibit the use of
29 live bait species.
30

1 Additionally, the City of New Braunfels will continue to prohibit, by Ordinance, the introduction of
2 domestic and non-native aquatic organisms, targeting specifically bait species and aquarium trade species
3 into the Comal system. This action may include outreach, education and signage at key entrance points
4 to parks on Landa Lake and the Comal River.
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6 **10. Litter Collection and Floating Vegetation Management (§**
7 **5.2.10)**
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9 The City of New Braunfels will continue to remove litter and dislodge floating vegetation mats from the
10 Comal Springs, Landa Lake, and Old and New Channels of the Comal River. Litter found within floating
11 vegetation mats will be removed before dislodging. In the event of low-flow conditions, increased efforts
12 to dislodge floating vegetation mats will be implemented. Collection and removal of litter and debris may
13 include diving within the Comal River and Landa Lake.
14

15 **11. Management of Golf Course Diversions and Operations (§**
16 **5.2.11)**
17

18 The City of New Braunfels will continue to implement a golf course management plan that will document
19 current practices following their Integrated Pest Management Plan (IPMP) for the Landa Park Golf Course.
20 The golf course management plan and IPMP incorporate environmentally sensitive techniques to
21 minimize chemical application, improve water quality, and reduce negative effects to the Covered Species.
22 Additionally, the IPMP is reviewed annually and revised as needed. Expanded water quality sampling
23 targeted at Golf Course operations will continue to be conducted per Section of 5.7.2 of the EAHCP.
24

25 **12. Management of Household Hazardous Wastes (§ 5.7.5)**
26

27 To reduce the potential of water quality pollution, the City of New Braunfels will continue the Household
28 Hazardous Waste program established in Phase I. The City of New Braunfels, in collaboration with Comal
29 County and New Braunfels Utilities, will continue to collect household hazardous wastes and unwanted
30 medications that will be disposed of at four collection events held throughout the year.
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13. Impervious Cover/Water Quality Protection (§ 5.7.6)

The City of New Braunfels will continue to implement the strategies for impervious cover and water quality management identified in the 2017 *Water Quality Protection Plan (WQPP): Phase I* report. Utilizing low impact development and best management practices, the WQPP recommends seven potential water quality retrofit projects to be established within the Comal River watershed. Potential impervious cover and water quality protection projects include the design and installation of bioretention basins, an underground storm drain vault, rain gardens and permeable pavers. These measures, in addition to the City of New Braunfels’ MS4 and Stormwater Management programs, will aid in reducing pollutant contributions to the Comal River system.

14. Native Riparian Habitat Restoration (§ 5.7.1)

The City of New Braunfels will continue the efforts achieved in Phase I to increase the area of the riparian zone along Landa Lake and the Old Channel. Plans to increase coverage and density of native vegetation include removal of non-native riparian vegetation, planting of native vegetation and maintenance of restoration zones to prevent re-establishment of non-natives and promote growth of native vegetation. Candidate riparian species are selected based on the success of previous restoration efforts.

If non-native plant treatment is needed on riparian private property, the City of New Braunfels will work with private landowners to coordinate methods for removal and planting of native species. Participation and coordination with private landowners will occur on a volunteer basis. Areas that need more riparian planting will be planted with drought-tolerant, native species, as needed.

C. City of San Marcos and Texas State University

1. Texas Wild-Rice Enhancement and Restoration (§§ 5.3.1, 5.4.1)

1 Phase II implementation for Texas wild-rice (TWR) enhancement and restoration will continue to include
2 activities such as removal of non-native aquatic plant species, propagation of Texas wild-rice plants, and
3 planting of Texas wild-rice plants. The quantity and location of areas restored in this program are provided
4 in Table 34 of the *Submerged Aquatic Vegetation Analysis and Recommendations Report* (BIO-WEST and
5 Watershed Systems Group, Inc, 2016).

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7 **2. Management of Recreation in Key Areas (§§ 5.3.2, 5.4.2)**

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9 Texas State University and the City of San Marcos will continue to control recreation in Spring Lake and
10 the San Marcos River.

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12 To minimize the impacts from recreation, Texas State University may establish and manage recreation
13 access points on the west bank of the San Marcos River between Spring Lake Dam and the Aquarena Drive
14 bridge, or other areas as needed. Riparian areas between access points will be maintained with dense
15 vegetation to discourage streamside access.

16

17 To minimize the impacts from recreation, the City of San Marcos has established and will manage
18 permanent river access points at across from Lion’s Club Tube Rental and one just below pedestrian
19 bridge, Hopkins Street bridge, Bicentennial Park, Rio Vista Park, and two at Ramon Lucio Park (§ 5.3.7).
20 Riparian areas between access points have been planted and will be maintained with native, dense
21 vegetation to discourage streamside access.

22

23 To support the TPWD’s creation of the State Scientific Area in the San Marcos River (§ 5.6.1), the City of
24 San Marcos and Texas State University will establish exclusion zones in critical areas to protect Texas wild-
25 rice and San Marcos salamander habitat from recreational impacts, as well as continue to maintain kiosks
26 at key areas along the river that show access points, exclusion zones, and associated educational
27 components at key locations.

28

29 The City of San Marcos will continue to employ a group called the Conservation Crew to help educate,
30 monitor recreational use, and other activities, as needed, in the San Marcos River. Activities include, but
31 are not limited to, collecting trash, educating recreationists about the threatened and endangered species

1 that live in the river, installing and maintaining exclusion barriers, as well as monitoring vulnerable stands
2 of Texas wild-rice and San Marcos salamander habitat to reduce adverse impacts from recreation.

3
4 **3. Native Riparian Habitat Restoration (§ 5.7.1)**

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6 The City of San Marcos will continue to undertake a program to increase the area of the riparian zone on
7 public lands along the banks of the river using native vegetation. Texas State University will continue to
8 restore the riparian zone with native vegetation in Sewell North and Spring Lake. Phase I activities focused
9 on non-native removal and planting of native riparian species. While some areas may require new riparian
10 plants over time, Phase II riparian activities will be focused more on non-native removal and maintenance.
11 If non-native plant treatment is needed on riparian private property, the City of San Marcos will work with
12 private landowners, on a voluntary basis, to coordinate methods for removal and planting of native
13 species. Areas that need more riparian planting will be planted with drought-tolerant, native species, as
14 needed.

15
16 **4. Control of Non-Native Plant Species (§§ 5.3.8, 5.4.12)**

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18 Texas State University and the City of San Marcos will continue to implement a non-native plant
19 replacement program from Spring Lake to city limits. Non-native species of aquatic, littoral, and small
20 caliper riparian plants (less than 4") will be replaced with native species to enhance Covered Species
21 habitat. The quantity and location of aquatic areas restored in this program are provided in Table 34 of
22 the *Submerged Aquatic Vegetation Analysis and Recommendations Report* (BIO-WEST, Watershed
23 Systems Group, Inc, 2016). The non-native aquatic plants will be shaken, checked for aquatic fauna, and
24 transported to the Texas State composting facility. Aquatic fauna that are recovered will be documented
25 and returned to the system. Areas will be "weeded" until the area is suitable to plant native aquatic
26 vegetation.

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30 **5. Control of Harmful Non-Native and Predator Species (§§ 5.3.9,
31 5.4.13)**

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In accordance to Phase I efforts, The City of San Marcos and Texas State University will continue to implement non-native and predator species control for the San Marcos River and Spring Lake on a periodic basis with expanded effort of control, if needed, at low flows. The targeted species include, but are not limited to, suckermouth catfish, tilapia, nutria, zebra mussels, ramshorn and red-rimmed melania snails. Routine biological monitoring will be conducted by EAA and EAHCP contractors (§ 6.3.1) to monitor and assess the distribution of new or existing harmful non-native and invasive species. If a threat is identified, EAHCP staff will work with the contractor to identify areas of concern and potential methods for removal.

6. Reduction of Non-Native Species Introduction (§§ 5.3.5, 5.4.11)

Dumping aquariums into the San Marcos River and its tributaries will continue to be minimized through education, including signage and brochures, and offering alternative disposal to citizens wanting to get rid of unwanted aquatic pets. The City of San Marcos will continue to operate a fish drop-off pond at their Discovery Center where residents can donate unwanted fish and aquatic animals. Outreach efforts will continue through education events, flyers, advertisements, and partnering with Texas State University to educate current and future students.

7. Sediment Removal below Sewell Park (§§ 5.3.6, 5.4.4)

The removal of sediment in support of native aquatic planting activities has proved to be both unnecessary and overly expensive. In Fall 2017, a non-routine adaptive management proposal to amend this conservation measure in the EAHCP was approved (Large, 2018). The Sediment Removal (§ 5.3.6 and § 5.4.4) and Impervious Cover/Water Quality Protection (§ 5.7.6) are combined into one conservation measure that addresses sediment control within the upper San Marcos River watershed to minimize sediment and contaminated runoff. The primary focus is the Sessom Creek watershed, which contributes loads of sediment during rain events and increases sediment deposition on TWR stands and other native plant stands near the Sessom Creek confluence to City Park. The City of San Marcos and Texas State University will oversee the design and construction of best management practices (BMPs) that control erosion, minimize sedimentation, and reduce pollutants in the San Marcos River watershed.

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D. City of San Marcos

1. Minimizing Impacts of Contaminated Runoff (§ 5.7.4)

In Spring 2017, this conservation measure was revised through non-routine adaptive management to cover two new sedimentation ponds as identified by City of San Marcos staff and the San Marcos Water Quality Protection Plan staff (John Gleason LLC, 2017; Large, 2018).

The first pond, located adjacent to the City Park, was designed to remove sediment and street pollutants from runoff prior to entering the river. The size, shape, and depth were determined based on an analysis of the volume of water discharging from the storm drains. The City Park biofiltration pond will be completed in 2018. The City of San Marcos will undertake required maintenance of the sedimentation pond on a regular basis.

The second pond, located next to C.M. Allen Street parking lot near the San Marcos Plaza, is referred to as the Downtown Pond. Upon completion of the Downtown sediment retention pond, the City of San Marcos will assume financial responsibility of maintenance of the both ponds, as this measure is no longer funded as part of Phase II.

2. Management of Public Recreational Use of San Marcos Springs and River Ecosystem (§ 5.3.2.1)

Public recreational use of the San Marcos Spring and River ecosystems include, but are not limited to swimming, wading, tubing, boating, canoeing, kayaking, golfing, scuba diving, snorkeling and fishing. In accordance to Phase I efforts, the City of San Marcos will continue to implement the Recreation Mitigation Measures adopted by the San Marcos City Council on February 1, 2011 (Resolution 2011-21) (Appendix P of the EAHCP). In addition, pursuant to Section 9.2 of the Interlocal Agreement, the City of San Marcos will issue Certificates of Inclusion (COIs) to those commercial outfitting businesses (businesses and nonprofit entities that rent tubes, canoes, kayaks, or similar equipment to facilitate recreational activities on the San Marcos River) (Outfitters) that comply with the requirements of the COI program established in section 5.3.2.1 of the HCP.

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3. Management of Aquatic Vegetation and Litter below Sewell Park (§ 5.3.3)

In accordance to Phase I efforts, the City of San Marcos will continue to perform activities to manage floating vegetation and litter to enhance habitats for the Covered Species. Management activities include removal of vegetation mats that form on top of the water surface as well as on top of Texas wild-rice and native plants, particularly during low flows, and removal of litter.

The City of San Marcos will continue to dislodge and remove floating vegetation near or on top of any Texas wild-rice and native aquatic plant stands. The City will also monitor downstream Texas wild-rice stands to keep the stands clear of drifting vegetation.

Inorganic litter will also continue to be removed from the San Marcos River from City Park to IH-35 during the recreational season (May through September) and less often during offseason.

4. Prohibition of Hazardous Materials Transport Across the San Marcos River and Its Tributaries (§ 5.3.4)

Hazardous materials transported by truck across the watershed of the San Marcos River and its tributaries presents the possibility of accidental spills or releases into the environment. The limited geographic distribution of the endangered species at San Marcos Springs could cause the species to be highly impacted by such a spill.

The City of San Marcos will continue to coordinate with the Texas Department of Transportation (TxDOT) to designate hazardous materials routes which minimize the potential for spills entering the San Marcos River. This effort may include legislation, if necessary, and additional signage.

5. Designation of Permanent Access Points/Bank Stabilization (§ 5.3.7)

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To minimize the impacts of recreation, permanent access points were combined with bank stabilization at various locations during Phase I. They serve as entry and exit ways that could be used by canoeists, tubers, swimmers, etc., while stabilizing highly eroded banks. The City of San Marcos has stabilized banks in eroded areas that include two in City Park, Hopkins Street Underpass, Bicentennial Park, Rio Vista Park, and two in Ramon Lucio Park.

Natural rocks were used to create a stone terrace for access and bank stabilization with the bank on either side restored with riparian vegetation. Native riparian vegetation was planted in areas adjacent to the access/stabilization areas to discourage river users from entering the river in places other than the access point. Phase II activities will include upkeep of these access points. If additional repairs or maintenance is needed, the City of San Marcos will cover the financial responsibilities of construction costs.

6. Septic System Registration and Permitting Program (§ 5.7.3)

The City of San Marcos has undertaken an aerobic and anaerobic septic system registration, evaluation, and permitting program to prevent subsurface pollutant loadings from potentially being introduced to the San Marcos Springs ecosystem within its city limits.

7. Management of Household Hazardous Wastes (§ 5.7.5)

In accordance to Phase I efforts, the City of San Marcos will continue to maintain a Household Hazardous Waste (HHW) program that involves the periodic collection of HHW and its disposal.

8. Impervious Cover/Water Quality Protection (§ 5.7.6)

In 2017, the City of San Marcos approved the San Marcos Water Quality Protection Plan (WQPP), a comprehensive program to protect water quality and reduce the impacts of impervious cover (John Gleason LLC., 2017). Criteria and incentives for the program were based upon the WQPP and the EAHCP LID/Water Quality Work Group Final Report (Appendix Q of the EAHCP) recommendations for Implementation Strategies and best management practices. The WQPP has identified Sessom Creek

1 tributary as a priority watershed (John Gleason LLC, 2017). Erosion prevention and stormwater
2 management designs will be implemented in this watershed during Phase II. Efficacy of the erosion
3 prevention and stormwater management designs may be assessed through water quality sampling,
4 funded through grants and other sources.

5

6 **E. Texas State University**

7 **1. Management of Submerged and Floating Aquatic Vegetation** 8 **in Spring Lake (§ 5.4.3.1)**

9

10 Texas State University will continue to manage aquatic vegetation in Spring Lake through use of its
11 harvester boat and through hand cutting of vegetation by divers authorized to dive in Spring Lake.
12 Vegetation restoration activities around the spring openings will be monitored by trained divers and
13 documented through various methods.

14

15 Each week, hand cutting of vegetation around five springs within Spring Lake will occur. Routine
16 maintenance will occur every two to three weeks following initial vegetation maintenance. During
17 summer algal blooms, the springs will be managed more frequently (up to four springs per day), but mostly
18 to remove algae. Texas State employees and supervised volunteers will find the area around the springs
19 to remove accumulated sediment, and then clear a 1.5-meter radius around each spring opening in Spring
20 Lake with a scythe. Over the next 1.5-meter radius around the spring opening, they will shear vegetation
21 to a height of 30 cm, and then to one meter over the following three-meter radius. Plant material will not
22 be collected but carried away by the current. Cumulatively, about six meters of vegetation around each
23 spring opening will be modified. Mosses will not be cut. The volume of plant material to be removed will
24 vary by the amount of time between cuttings, and season.

25

26 The harvester boat will remove a range of 15-to-20 boatloads of plant material a month from Spring Lake.
27 The harvester will clear the top meter of the water column, cutting vegetation from sections one, two,
28 and three once a week. The harvested vegetation will be visually checked by driver for fauna caught in
29 the vegetation. If the driver observes fauna, he/she will stop work and put the animal(s) back into Spring
30 Lake, if appropriate. Texas State employees and supervised volunteers are trained to recognize the
31 Covered Species through the Diving for Science program and avoid contact with them.

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The Spring Lake Area Supervisor will continue to schedule cleanup of nuisance floating species such as water hyacinth and water lettuce from Spring Lake. The floating plants will be collected by hand and shaken prior to removal from the river to dislodge any aquatic species caught in the plant. The plants will be deposited into dump trucks and taken to the Texas State University compost area.

2. Management of Aquatic Vegetation from Sewell Park to City Park (§ 5.4.3.2)

In accordance to Phase I efforts, Texas State University will continue to dislodge and remove floating vegetation on any Texas wild-rice and native aquatic plants. Inorganic litter will be picked up weekly from the San Marcos River from Sewell Park to City Park during the recreational season (Memorial Day to Labor Day) and monthly during offseason.

Texas State University will continue to monitor downstream Texas wild-rice stands to keep the stands clear of drifting vegetation. Divers will not pick up litter in or around Texas wild-rice stands.

University employees or others will continue to be trained by the TPWD to recognize Texas wild-rice and to protect the plant stand while removing the accumulated floating plant material. On Texas wild-rice stands, Texas State University employees will dislodge and remove the floating material from the top of the Texas wild-rice stands and allow it to float downstream. Downstream accumulations of plant material will be removed by the City of San Marcos to avoid impacts to Texas wild-rice further downstream.

3. Diversion of Surface Water (§ 5.4.5)

Under TCEQ Certificates 18-3865 and 18-3866, Texas State University’s total diversion rate from the headwaters of the San Marcos River for consumptive use is limited to 8.1 cfs. The total diversion rate from Spring Lake is limited to 4.88 cfs; the total diversion rate from the San Marcos River at Sewell Park is limited to 3.22 cfs. To minimize the impacts of these diversions, when flow at the USGS gauge at the University Bridge reaches 80 cfs, Texas State University will reduce the total rate of surface water diversion by 2 cfs, i.e., to a total of approximately 6.1 cfs. This reduction in pumping will occur at the pump just

1 below Spring Lake Dam to maximize the benefits to salamanders, Texas wild-rice, and other aquatic
 2 resources in the San Marcos River below Spring Lake Dam. The University will reduce the total rate of
 3 surface water diversion by an additional 2 cfs when the USGS gauge reaches 60 cfs. The additional 2 cfs
 4 reduction will be made from the pumps located in the slough arm of Spring Lake, and, therefore, maximize
 5 the benefits to the aquatic resources within the main stem San Marcos River below Spring Lake Dam.
 6 When the USGS gauge reaches 49 cfs, Texas State University will reduce the total diversion rate to 1 cfs.
 7 This further reduction will be made by restricting the pumps located in the Sewell Park reach. The
 8 diversion of water will be suspended when springflow reaches 45 cfs.

9
 10 The reductions in Texas State University’s total diversion rate for consumptive use is summarized in the
 11 Table below:
 12

Streamflow (cfs)	Spring Lake Diversions (cfs) Cert. No. 18-3865	San Marcos River Diversions (cfs) Cert. No. 18-3866	Total Diversion Rate (cfs)
>80	4.88	3.22	8.1
80 – 60	2.9	3.2	6.1
60 – 49	0.9	3.2	4.1
49-45	1.0	0	1.0
<45	0	0	0

13
 14 To avoid or minimize the impacts of the surface water diversions, the University will routinely monitor the
 15 screens to determine if any entrainment occurs and will make any necessary modifications to the screens
 16 to minimize any incident take from the operation of the diversions.
 17

18 **4. Diving Classes in Spring Lake (§ 5.4.7)**

19 **a. The Diving for Science Program**
 20

21 To minimize the impacts of the Diving for Science Program that trains and authorizes individuals to dive
 22 in Spring Lake, individuals authorized through this program must demonstrate a knowledge of listed
 23 species found in the lake and their habitat, laws and regulations impacting these species, good buoyancy

1 control, the ability to avoid contact with listed species, the ability to avoid disturbing critical habitat, and
2 the ability to stay off the bottom of the lake. The program is taught as a two-day class with a maximum
3 class size of 20 and is taught in the Dive Training Area. The program averages 350 trainees per year. Upon
4 completion of this class, divers are allowed anywhere in Spring Lake to perform specific volunteer tasks
5 such as finning spring areas covered with algae and picking up litter. Projects are structured to minimize
6 contact with listed species in an effort to ensure protection of listed species and their habitat. The Diving
7 Supervisor coordinates and supervises all volunteer diving. No more than 16 volunteer divers will be
8 allowed in the lake per day, with no more than eight at one time.

9
10 Any individual diving outside of the Dive Training Area must have completed the Diving for Science
11 Program.

12 13 **b. Texas State University Continuing Education**

14
15 Texas State University Continuing Education classes for check-out dives will continue to be conducted in
16 the Dive Training Area. To minimize the impacts of these classes, class size will be limited to 12 students
17 and no more than three classes will be conducted per day.

18 19 **c. Texas State University SCUBA Classes**

20
21 Texas State University SCUBA classes will continue to be conducted in the Dive Training Area. To minimize
22 the impacts of these classes, class size will be limited to 12 students and no more than three classes will
23 be conducted per day.

24 25 **5. Research Programs in Spring Lake (§ 5.4.8)**

26
27 In accordance to Phase I efforts, all proposals to conduct research in Spring Lake will continue to be
28 reviewed by the Meadows Center for Water and the Environment to ensure there is no impact on Covered
29 Species or their habitat. If incidental take cannot be avoided, it will be minimized by educating the
30 researchers as to the area where the listed species are located and by requiring measures to minimize any

1 potential impacts. All diving in support of a research study will be provided by individuals who have
2 completed the Diving for Science program.

3 4 **6. Boating in Spring Lake and Sewell Park (§ 5.4.10)**

5
6 In accordance to Phase I efforts, boats in Spring Lake will continue to be confined to areas that are mowed
7 by the harvester, thereby not impacting vegetation and specifically avoiding Texas wild-rice stands.
8 Individuals will enter and exit boats at specified access points to avoid impacting the flora and fauna along
9 the bank. All boats launched into Spring Lake will undergo a USFWS-approved process for cleaning.

10
11 Further, canoeing/kayaking classes in the lake will be limited to no more than two classes per day and
12 each class will be in the water no more than one hour. Classes will have a maximum of 20 students in 10
13 canoes. All classes will be supervised.

14
15 To minimize the impacts of boating on the Covered Species' habitat in Sewell Park, canoeing/kayaking
16 classes in Sewell Park will continue to be confined to the region between Sewell Park and Rio Vista dam.
17 Students will enter/exit canoes/kayaks at specified access points to avoid impacting the flora and fauna
18 along the bank. Classes will be no longer than two hours and up to three classes will be held per day.
19 Classes will have a maximum of 20 students in 10 canoes. All classes will be supervised by Texas State
20 University Meadows Center.

21 22 **F. San Antonio Water System**

23 **1. Use of the SAWS ASR for Springflow Protection (§ 5.5.1)**

24
25 The San Antonio Water System (SAWS) ASR facility will continue to be used to store and deliver Aquifer
26 water acquired by the EAA in exchange for actions outlined in an Interlocal Contract between the EAA and
27 SAWS for the purposes of springflow protection. When triggers are reached, SAWS will forbear usage
28 initially in its North East service areas large primary groundwater pumping facilities. These facilities, from
29 a regional perspective, are considered nearest to the springs and provide groundwater pumping relief
30 during extreme drought. As described below, an amount equivalent to the water recovered from the ASR
31 will be used to offset SAWS's Edwards aquifer demands.

1
2 EAA will continue to acquire, through a combination of leases and forbearance agreements, 50,000 ac-
3 ft/yr of EAA-issued Final Initial Regular Permits. The leases will used to fill, idle, and maintain a portion of
4 the capacity of the SAWS ASR Project for subsequent use to protect springflows.

5
6 The program is comprised of two components. The first will lease approximately 16,667 acre-feet of
7 permits, that will be used storage in the ASR and ultimately for forbearance purposes. The remaining
8 33,333 acre-feet will be enrolled into forbearance agreements. Forbearance will be required in years after
9 the 10-year moving annual average of Edwards recharge falls below 500,000 ac-ft/yr, as determined by
10 the EAA.

11
12 Trigger levels for implementation of ASR management in accordance with the EAHCP will be 630 ft-MSL
13 at the J-17 index well during an identified repeat of drought conditions similar to the drought of record as
14 indicated by the ten-year rolling average of Edwards recharge of 500,000 ac-ft, as determined by the
15 EAA. When triggered, the ASR or other supplies capable of utilizing shared infrastructure will be activated
16 to deliver up to 60 million gallons per day to SAWS distribution system during a repeat of drought of
17 record-like conditions. When the monthly average groundwater levels at J-17 are below 630 ft-MSL and
18 the ten-year rolling average of Aquifer recharge is 500,000 ac-ft or less, pumping of selected wells on the
19 northeast side of SAWS water distribution system will be reduced in an amount that on a monthly basis
20 equals the amount of water returned from the ASR only to the extent of the Aquifer water provided by
21 the EAA for storage in the ASR. SAWS will use up to 100 percent of the conveyance capacity of existing
22 SAWS ASR facilities to off-set SAWS' Edwards Aquifer demand.

23
24 SAWS will attempt, to the extent practicable, to mimic the pattern of delivery and/or forbearance
25 developed by HDR Engineering (HDR 2011). However, the actual pattern of delivery of water from the ASR
26 program and/or forbearance may differ from what HDR used in its modeling simulations depending on
27 the actual course of the drought.

28
29 The two agencies entered an Interlocal Contract for the use of the Aquifer Storage and Recovery
30 capabilities to support Springflow Protection covering Phase I of the EAHCP Program. From time to time
31 the Interlocal Contract is brought up to date through adaptive management and/or necessary contractual
32 amendments but will continue to support protections throughout Phase II of the EAHCP Program.

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The use of the SAWS ASR is predicated on an assumption informed by HDR Engineers’ groundwater modeling that the SAWS ASR will be utilized to deliver approximately 126,000 ac-ft of water to SAWS distribution system during a decadal drought similar to the drought of record. It is further predicated on the assumption from HDR 2011 that the maximum amount of EAHCP water that will be delivered in a given year is 46,300 ac-ft.

SAWS will make the day-to-day decisions necessary to fulfill the ASR commitment. A 12-person Regional Advisory Group consisting of four representatives of SAWS, the Program Manager, and one representative each from EAA, EAA permit holder for irrigation purposes, small municipal pumpers, the Spring cities, environmental (including Texas Parks and Wildlife), industrial pumpers, and downstream interests will provide advice to SAWS regarding the implementation of the program. The Advisory Group will meet annually or as needed. SAWS will organize and facilitate the Advisory Group.

G. Texas Parks and Wildlife Department

1. State Scientific Areas (§ 5.6)

Texas Parks and Wildlife Department (TPWD) has the authority to establish state “scientific areas” for the purposes of education, scientific research, and preservation of flora and fauna of scientific or educational value (TPW Code § 81.501). To minimize the impacts of recreation, TPWD will continue to pursue creation of state scientific areas in the San Marcos Springs ecosystem. The scientific areas will be designed to protect Texas wild-rice by limiting recreation in these areas during low flow conditions. The regulations are intended to preserve at least 1,000 m2 of Texas wild-rice.

Except for the eastern spillway immediately below Spring Lake Dam, none of the protected areas will extend across the entire river channel; thus, allowing longitudinal connectivity for recreation and access to be maintained downstream throughout the river. In their 3rd report, the National Academy of Sciences recommended controlling the footprint of recreation in the 50m reach below Spring Lake Dam. San Marcos salamanders have been found in abundance in the eastern spillway, so the majority of the spillway may be excluded from recreation. Exclusion zones in the remainder of the 50m reach may be established primarily around the Texas wild-rice stands.

1
2 Interlocal agreements between the City of San Marcos, TPWD and Texas State University will be pursued,
3 if necessary, for local in-water enforcement of the protected zones.

4
5 In order to protect existing and restored fountain darter habitat, TPWD may pursue the creation of a state
6 scientific area in the Comal Springs ecosystem. An interlocal agreement between the City of New
7 Braunfels and TPWD will be pursued, if necessary, for local in-water enforcement of the protected zones.

8
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10 **References:**

11 BIO-WEST, Watershed Systems, Group, 2016. *Submerged Aquatic Vegetation Analysis and*
12 *Recommendations Report*. Prepared for the Edwards Aquifer Authority.

13
14 AquaStrategies, BIO-WEST, 2017. *Landa Lake and Dissolved Oxygen Management Plan*. Prepared for the
15 City of New Braunfels

16
17 BIO-WEST, 2017. *Gill Parasite Monitoring in the Comal River 2017 Final Report*. Prepared for the City of
18 New Braunfels

19
20 John Gleason LLC, 2017. Water Quality Protection Plan for the City of San Marcos and Texas State
21 University. Edwards Aquifer Authority Contract deliverable for EAHCP § 5.7.6

22
23 Large, Daniel. 2018. Edwards Aquifer Recovery Implementation Program Habitat Conservation Plan
24 Addendum. Edwards Aquifer Authority contract deliverable for Contract 18-883L.

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26 **II. Costs**

27
28 The estimated cost of the EAHCP and the schedule by which those costs are expected to be realized are
29 set out in Table 7.1 of the EAHCP and are hereby incorporated by reference in this Comprehensive Plan.
30 The cost estimates are arrayed in the Table below according to the entity assigned by the EAHCP.