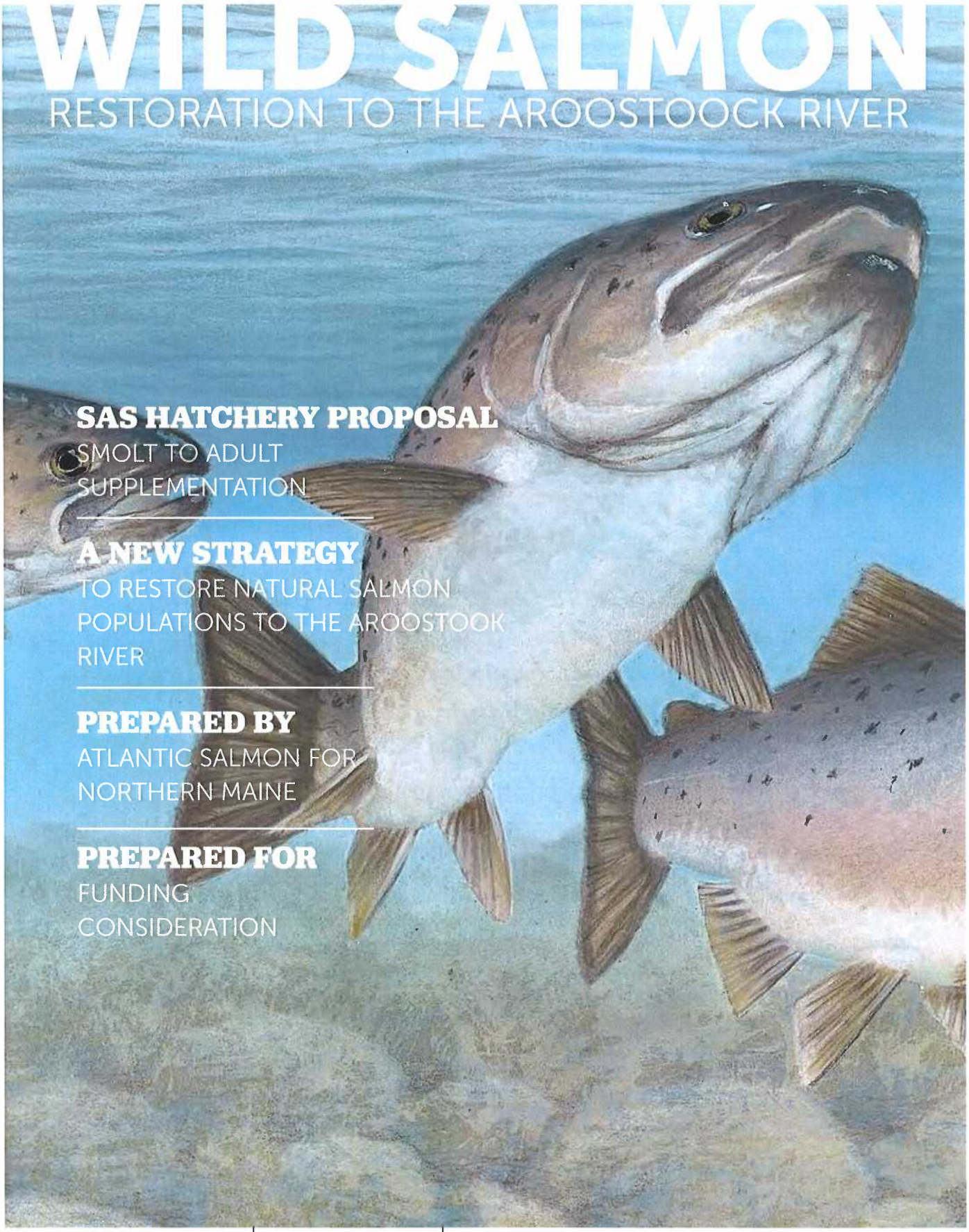
WILD SALMON

RESTORATION TO THE AROOSTOOCK RIVER



SAS HATCHERY PROPOSAL
SMOLT TO ADULT
SUPPLEMENTATION

A NEW STRATEGY
TO RESTORE NATURAL SALMON POPULATIONS TO THE AROOSTOOK RIVER

PREPARED BY
ATLANTIC SALMON FOR NORTHERN MAINE

PREPARED FOR
FUNDING CONSIDERATION

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Prepared with the assistance of Suasive Visual Design Ltd. and Briden Consultants Ltd.

PROPOSAL SUMMARY

SAS is a new strategy to restore natural salmon populations to the Aroostook River.

Rather than the current program of stocking hatchery reared smolts, wild smolts are captured and hatchery reared to adults. These adults are then placed in good spawning habitat. The resulting smolts will augment the wild smolts and compensate for the higher ocean mortality recently experienced.

The Aroostock River currently does not have a resident population of sea run Atlantic salmon due to downstream dams blocking migration. To adopt a strategy similar to the Penobscot River, genetically diverse eggs will be acquired from the Mactaquac Biodiversity Center (NB). These eggs will be reared in a new Caribou Hatchery to smolts, with surplus first feeding fry and parr being stocked into currently barren salmon habitat. Sufficient smolts will be retained to yield up to 5000 adults for river stocking and reproduction. Eventually, out migrant natural smolts will be captured to sustain this adult stocking program.

CONTENTS

STATEMENT OF NEED

What is the issue that we are addressing and why does it matter?

Sea run salmon have effectively been extirpated by dams blocking migration. This has an ecological impact on the river and a cultural impact on Maine residents, both indigenous and non-native.

Why is what we propose necessary? What is the void it is addressing?

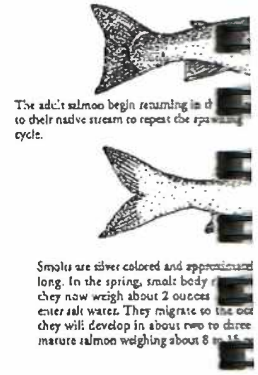
A sustained adult salmon population will allow for a traditional and recreational fishery. Out migration of smolts will augment production from other SAS programs on St. John River tributaries and enhanced survival past dams to the sea.

Who benefits? Indicate the public good.

The benefits extend beyond indigenous and recreational fishers to public engagement in the rearing program. A wild salmon recovery becomes a community event. A similar community involvement is evident in the Machias River recovery program. More programs like this are needed if the Atlantic salmon are to again flourish in Maine.

How are we addressing this issue?

The Aroostook County volunteers have networked with other similar minded and passionate volunteers and salmon restoration professionals to promote the salmon conservation hatchery plan that is presented here.

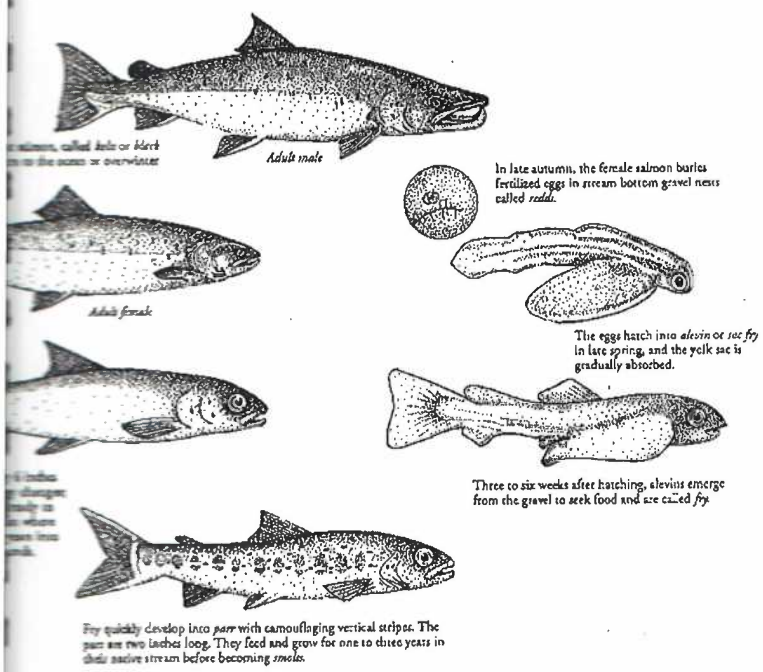


The adult salmon begin returning in t to their native stream to repeat the spawning cycle.

Smolts are silver colored and approximately long. In the spring, smolt body they now weigh about 2 ounces enter salt water. They migrate so the ocean they will develop in about two to three mature salmon weighing about 8 to 15

Life Cycle of the Atlantic Salmon

(Salmo salar)



Smolts

Why did we choose to address the issue in the manner that you have?

Recent successes with SAS programs to conserve endangered salmon populations in the inner Bay of Fundy and the move toward a SAS restoration program for the Penobscot River have been the models for the Caribou hatchery approach.

Parr

Atlantic Salmon for Northern Maine

Atlantic Salmon for Northern Maine (ASNM), a 501c3 non-profit organization in Aroostook County, has been operating for forty years, hatching St. John River salmon eggs and stocking salmon fry in the Aroostook River.

ASNM has been part of the St. John Basin Salmon Recovery Inc., a consortium of Canadian NGOs, since its inception. ASNM has invested more than $2.25 million (US) in operating funds since 1987 at its Dug Brook Hatchery including payment for salmon eggs to Department of Fisheries and Oceans Canada (DFO). The organization has also supplied capital funding for the construction of effective upstream fish passage facilities at the dam at Tinker, NB near the mouth of the Aroostook River. In addition, they have helped fund the construction of a site at the head of the Tinker headpond where trucks can access the river to release transported adult salmon. The fish passage donations totaled approximately $1.5 million (US). Furthermore, over 3000 volunteer hours per year have been expended by ASMN members each year, most of these to operate the hatchery. Over 40 years this equates to 120,000 hours of volunteer service. These efforts have been privately funded or have involved individual in-kind donations to the cause of Aroostook River salmon restoration by local businesses and individuals. The State of Maine contributed $30,000 for the purchase of salmon eggs, the only US government assistance ASNM has received.

In the fall of 2019, 43 adult returning sea-run salmon were lifted over Tinker Dam into Maine reaches of the Aroostook River. They represent the survivors of 40,000 eggs, and the surviving fry stocked in the river in 2014 or 2015, approximately a 1/1000 ratio of egg to adult. It was obvious that our existing approach was not succeeding - we needed a new and innovative strategy.

In 2019, ASNM signed an agreement with the Department of Fisheries and Oceans, Canada (DFO) in which DFO committed to supplying 50,000 Tobique River salmon eggs to ASNM each year for five years. ASNM in turn agreed to work towards constructing a rearing facility to support a Smolt to Adult Supplimentation (SAS) program and raise brood stock to allow ASNM to produce our own eggs. We are now nearly three years into that agreement.

Since then, ASNM has significantly refined our new strategy. We plan to raise and stock 5,000 adult salmon that are ready to spawn in the Aroostook River each year. We will retain 500 adult fish in the hatchery for egg production. Of the 5,000 fish put in the river, 1,500 will be allocated for a limited (permitted) sport fishery, 500 for a pilot subsistence fishery for the Aroostook Band of Micmacs and the Houlton Band of Maliseets, and 3,000 to spawn naturally in the river. Assuming that 50% are females, that should re-

Dug Brook hatchery.

sult in 15 million eggs in natural redds. Accounting for natural mortality in the river and sea, we estimate that as many as 1,500 adult fish could return from the sea in five or six years, utilizing the known ratio.

Historically, the St. John River (Wolastoq) was one of the most productive salmon rivers - if not the most productive - in North America. The Aroostook River was the most productive tributary of the St. John. The native wild salmon of the Aroostook were extirpated in the 1970s by the American built Tinker Dam, in New Brunswick, Canada. Our Canadian partners recognize the essential role that the Aroostook River plays in the effort to restore the salmon runs in the St. John, and have worked tirelessly on our behalf.

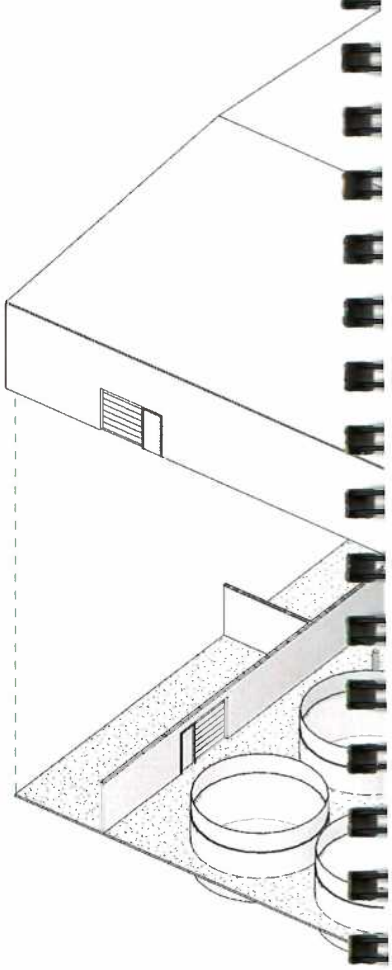
As the St. John River distinct population segment of Atlantic salmon is not listed as endangered by the US or the State of Maine, we have the option to utilize a sport fishery to support the effort to restore wild, sea-run salmon to the Aroostook River. This approach is both an aquaculture initiative and an economic development project, with ecological restoration as a result.

ASNM built a small salmon hatchery in Ashland, Maine, constructed a trap and lift at Tinker dam, and have maintained an all volunteer effort to hatch eggs and stock fry for forty years. We have established formal partnerships with the Aroostook Band of Micmacs, the Houlton Band of Maliseet Indians (HBMI), and the University of Maine at Presque Isle. ASNM purchased 12 acres of land on the river in Caribou, which includes aquifer wells and pumps from the former Caribou water district.

SAS Hatchery Proposal

We have limited capacity at our Dug Brook Hatchery, where we are raising fish beyond the fry stage for the first time. The Aroostook Band of Micmacs has assisted us with technical support and fish food from their brook trout hatchery.

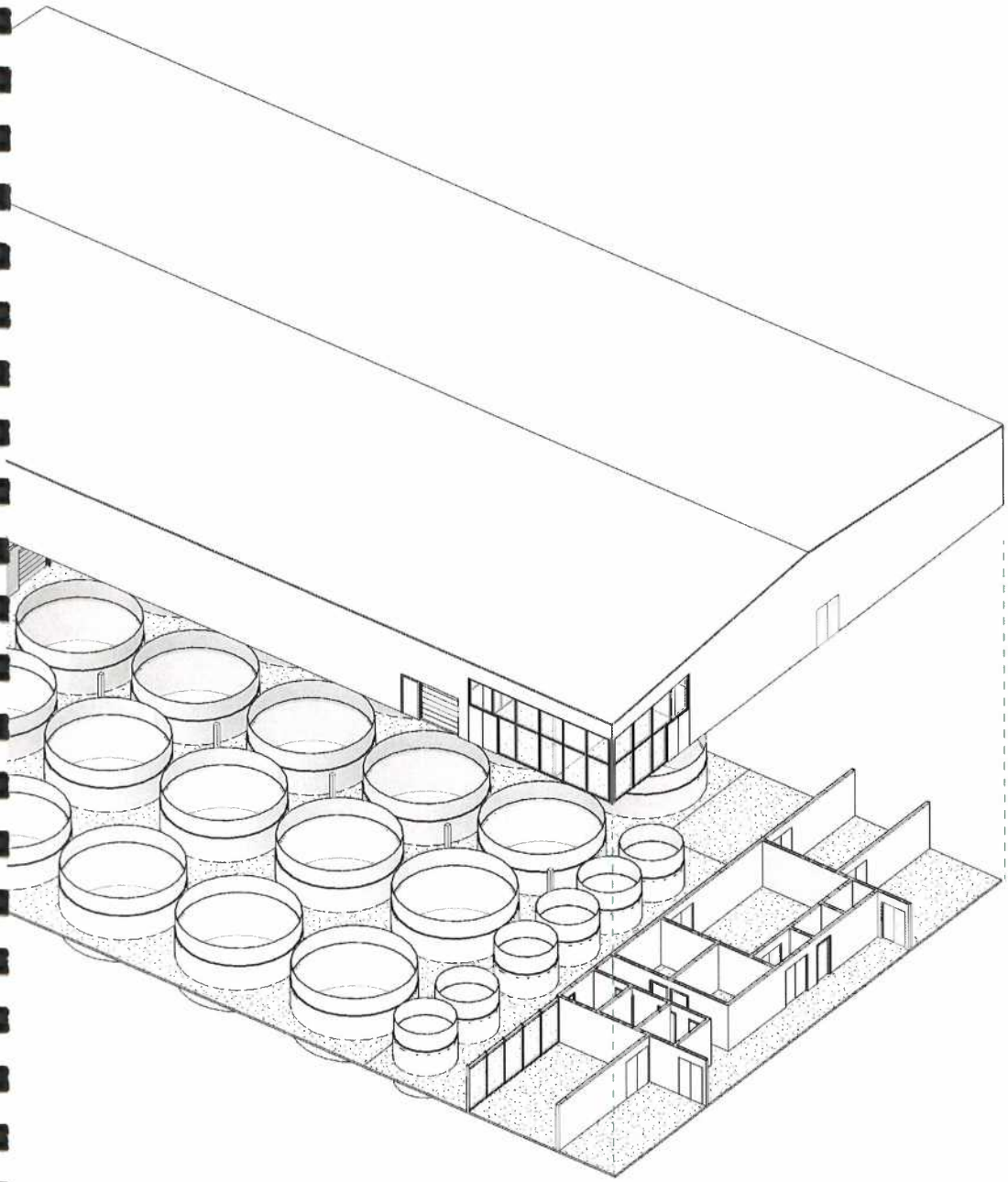
But, we are approaching a crisis. Our broodstock will outgrow our capacity in a year or two, and our agreement with DFO will expire in two years. We must expand our capacity and construct the rearing facility in Caribou to avoid losing all of the ground we have gained.



The proposed rearing facility will be designed to accommodate our annual objective of 5,000 adult spawners. We will also need to acquire operational funds, and we are in contact with JD Irving in that regard.

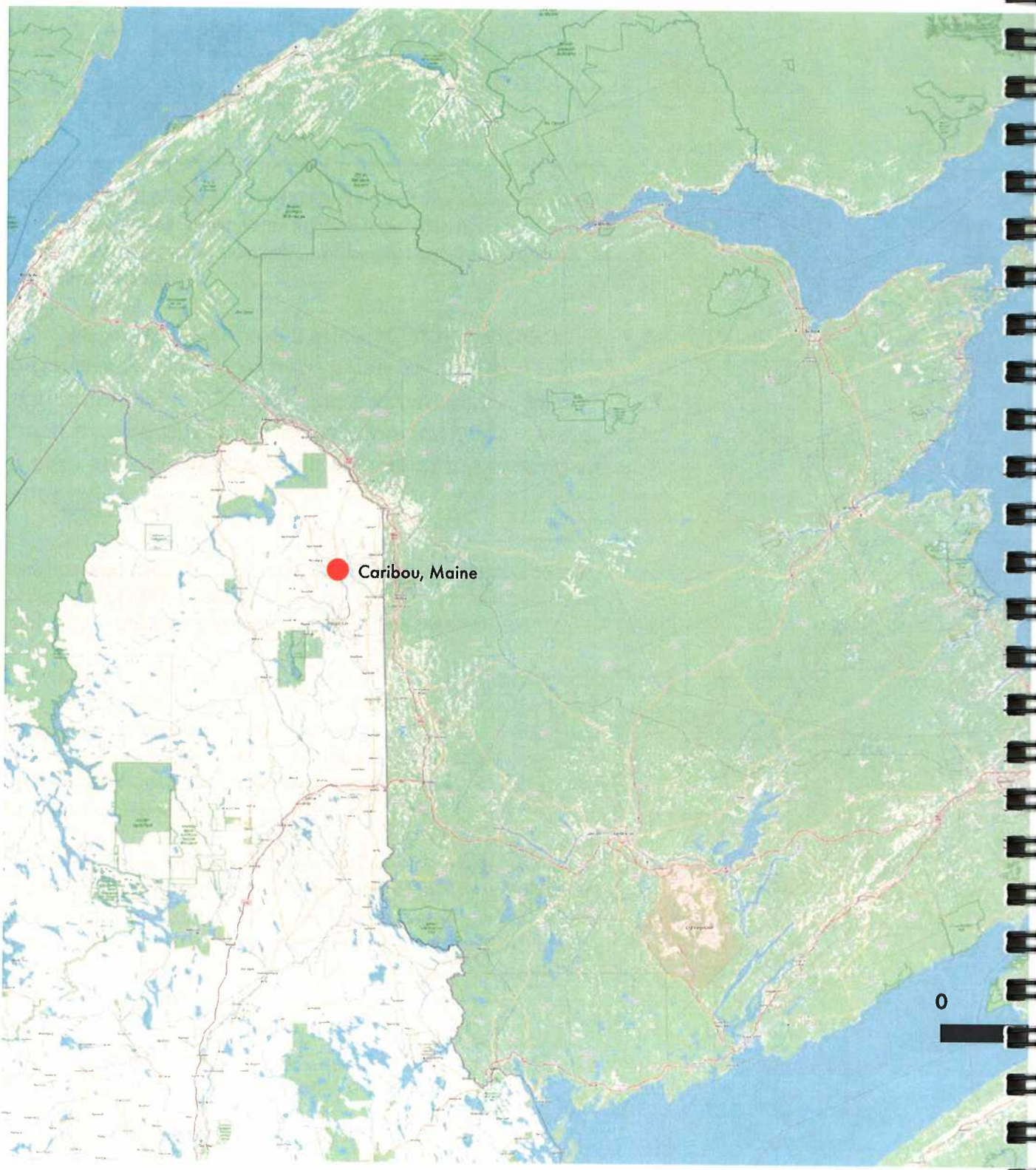
To evaluate the performance of our project, we must operate the facility for at least 15 years (three salmon generations). We can count the number of returning salmon at the Tinker Dam lift each year, but our first cohort won't return for five or six years (2-3 years in the river and two years at sea), and additional success of wild returning spawners would be evident only five years after that.

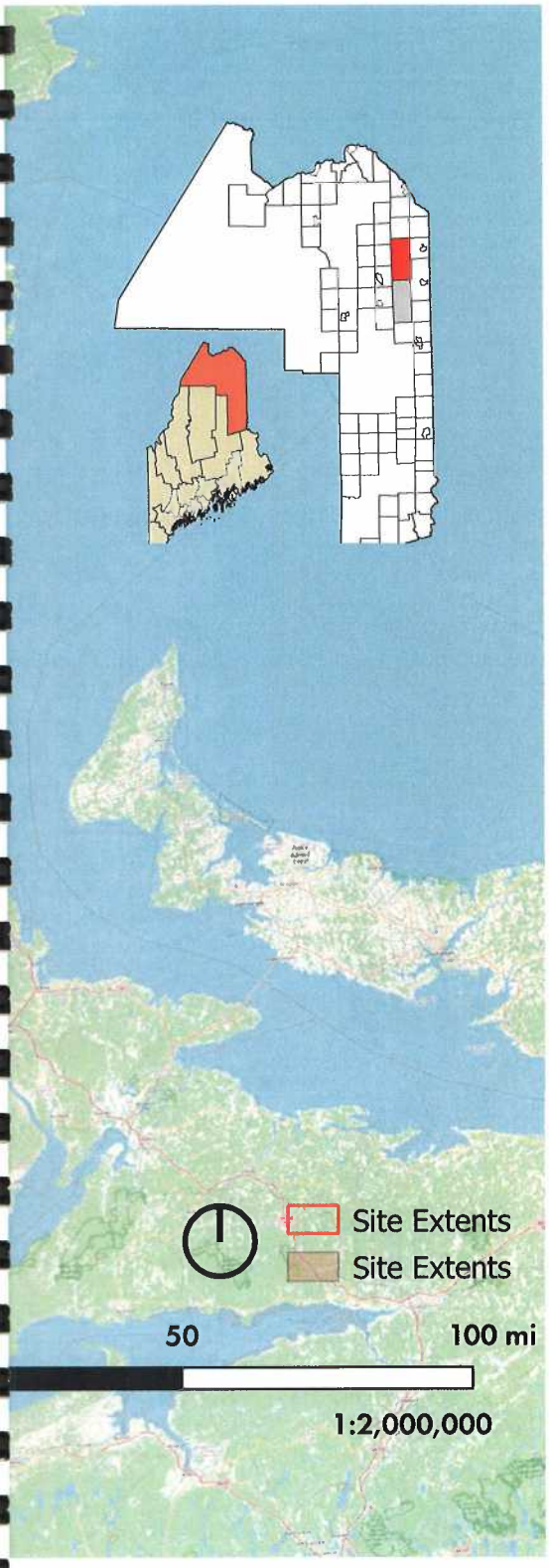
We are almost shovel ready, with the exception of developing the concept design into a developed design. We own the land, the City of Caribou is in strong support, we have a plan for the equipment and tanks and the strategy to include an initial put and take fishery was suggested by the Maine Department of Marine Resources. We just need the funds to get started.



Building Shell

Ground Floor Hatchery


Caribou, Maine
0



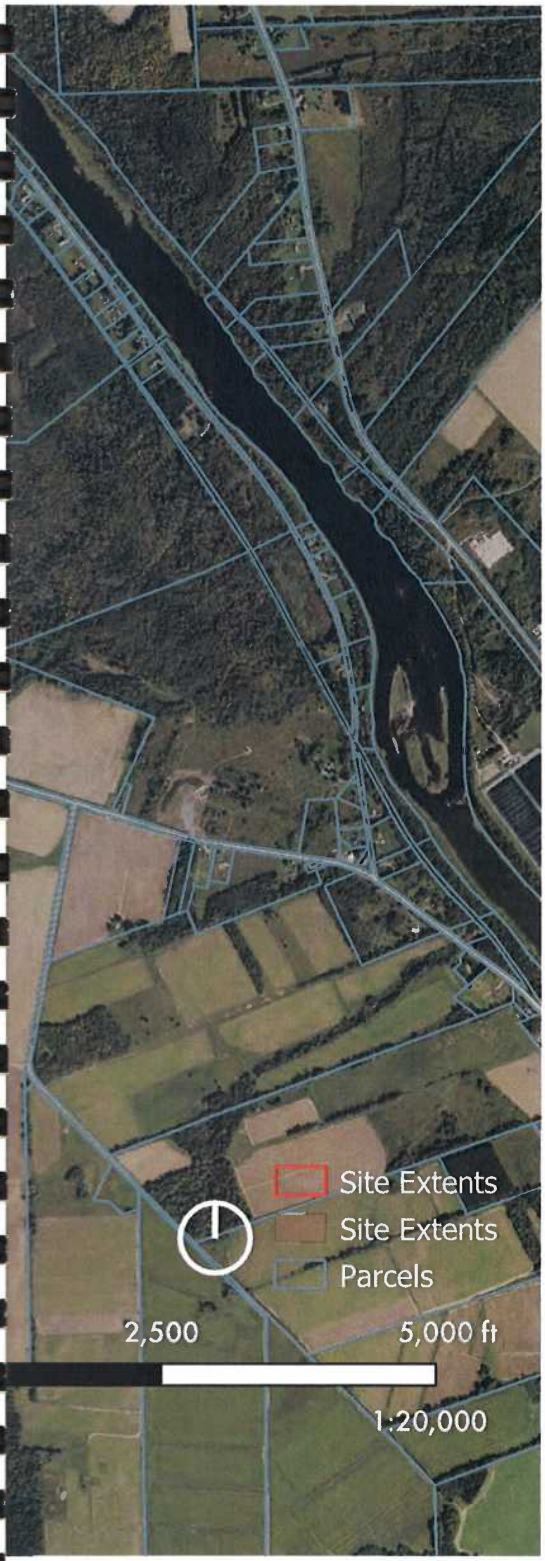
Site Description

12 acres of river front property on the west bank of the Aroostook River in the City of Caribou below the Caribou Dam.

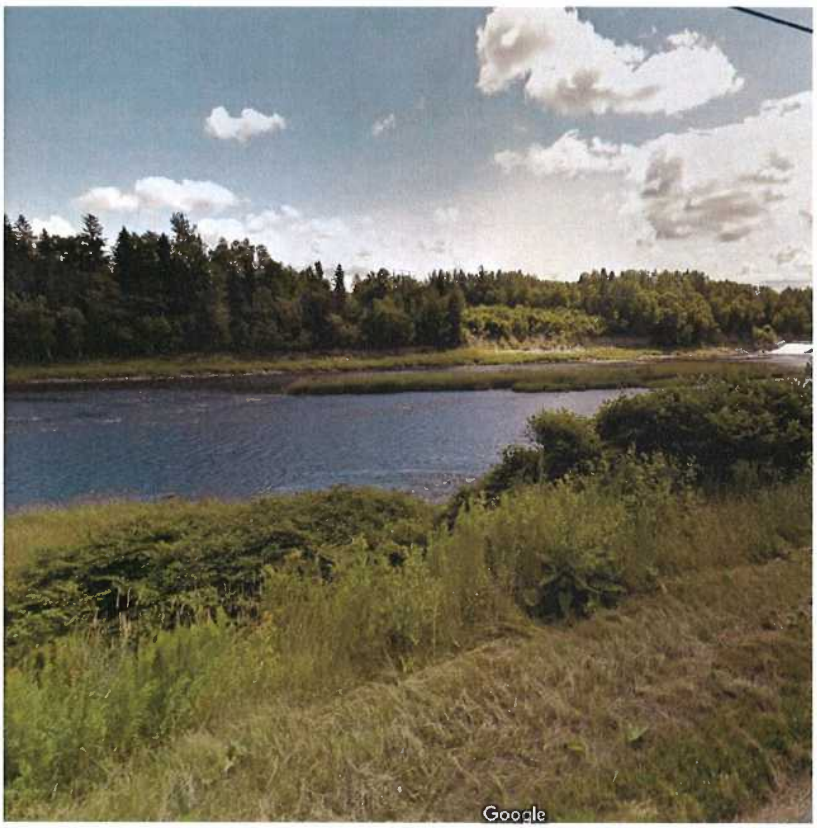
The St. John River drainage basin (39,900 km 2 /15,405 mi 2) is the largest drainage system between the St. Lawrence and Mississippi Rivers in Eastern North America. The St. John River historically supported one of the largest populations of sea-run Atlantic salmon in North America, numbering in the hundreds of thousands. The Aroostook River (6,320 km 2 /2,440 mi 2) is the largest tributary of the St. John below the fish passage barrier of Grand Falls, and was the largest producer of salmon in the drainage system. The construction of dams on the lower St John (Beechwood and Mactaquac), and the lower Aroostook in New Brunswick (Tinker Dam) significantly reduced the historic salmon runs. Modifications to Tinker Dam in the 1970s resulted in the extirpation of wild, sea-run salmon in the Aroostook River. Fish passage has been established at all three dams, and further improvements are currently underway. Atlantic Salmon for Northern Maine, Inc. owns 12 acres of river front property on the west bank of the Aroostook River in the City of Caribou below the Caribou Dam. The property is blighted from abandoned industry and our proposed redevelopment is consistent with the City of Caribou's river front planning committee. The property includes two aquifer wells and large capacity pumps that were developed to provide the city with drinking water, but have never been used.

The proposed SAS facility is located on a level T-2 terrace well above all historic flood elevations. The substrate is alluvial gravel, sand, and silt overlying ribbon limestone bedrock of the Cary's Mills FM. Several derelict buildings occupy the site. We will demolish the old Caribou Water Department building to provide green-space for the City of Caribou, and the Federation Building will be renovated and incorporated into the proposed development plans.

CONTEXT


Site Extents
Site Extents
Parcels
2,500
5,000 ft
1:20,000


Google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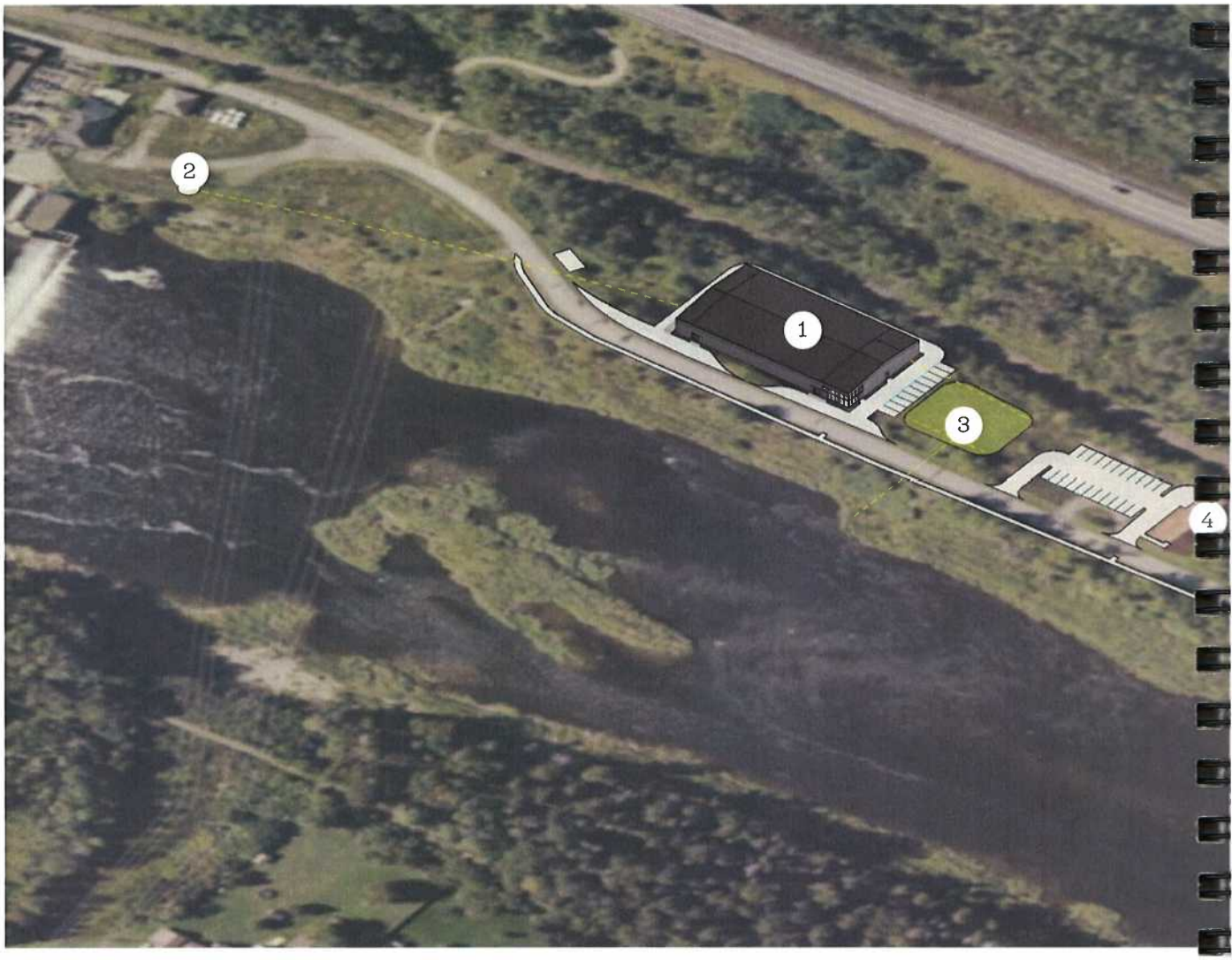
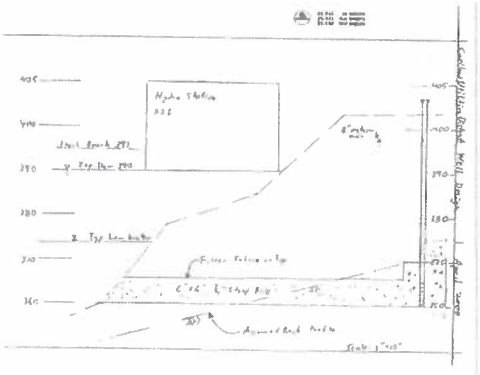
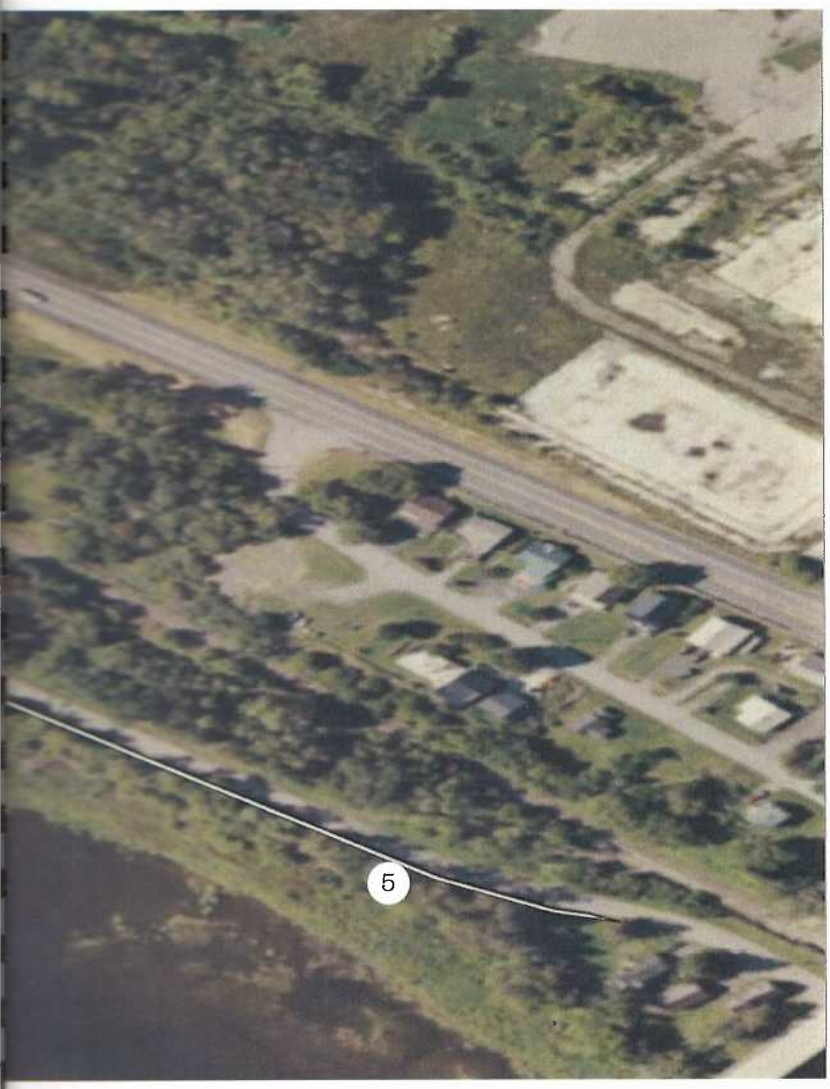
SITE EXTENTS



1. SAS Hatchery



2. Existing Wet Wells



A Holistic Approach

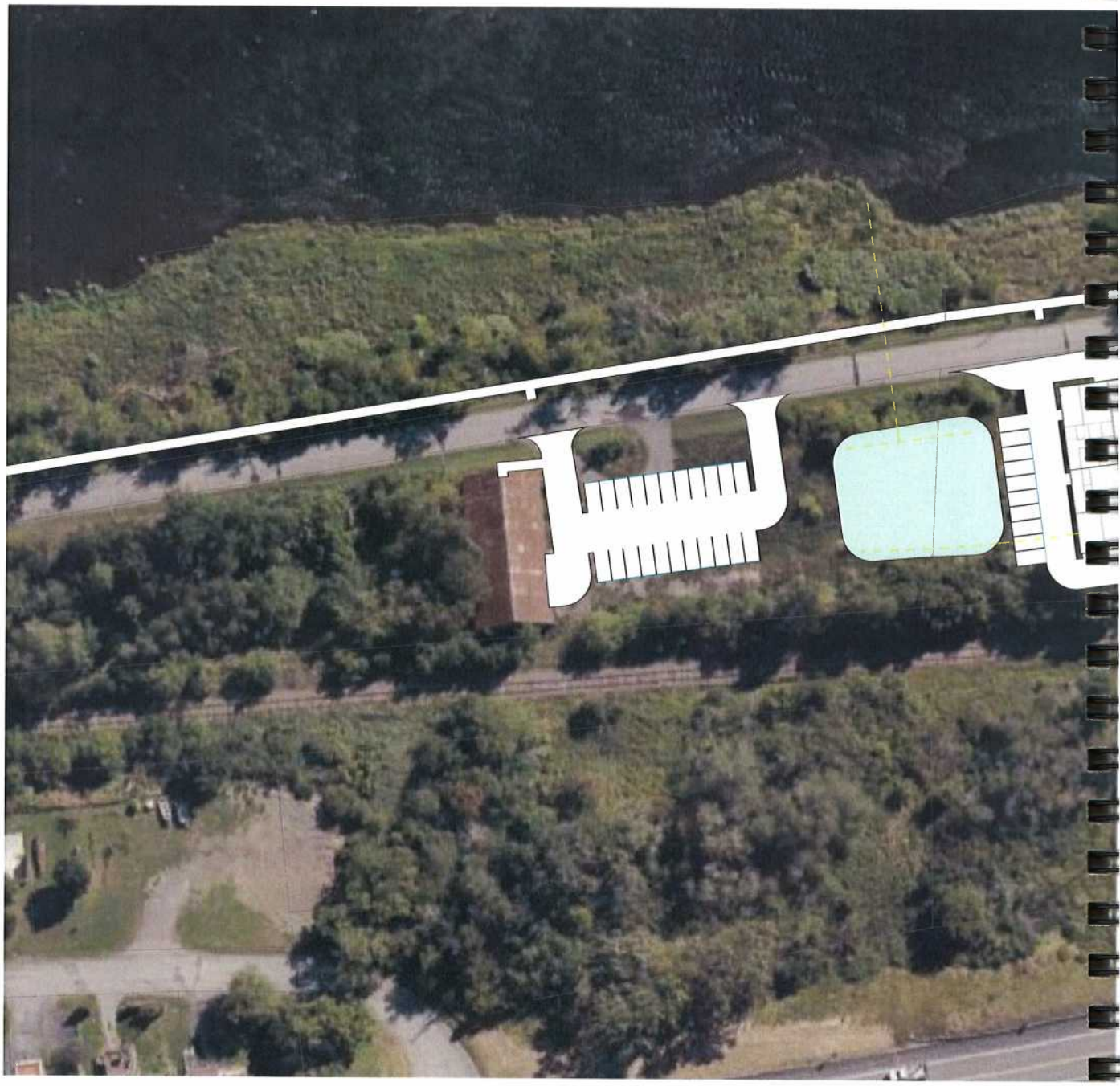
A proposal that leverages existing underutilized infrastructure and achieves its goals of rehabilitating the salmon population while engaging and enriching the community.

In addition to the primary facility (SAS Hatchery), we will utilize the existing underutilized wet wells, rejuvenate the Federation Building into a community engagement center, and naturalize the sites infrastructure with a constructed wetland. A Shared-use pathway will weave the site into the local community fabric.

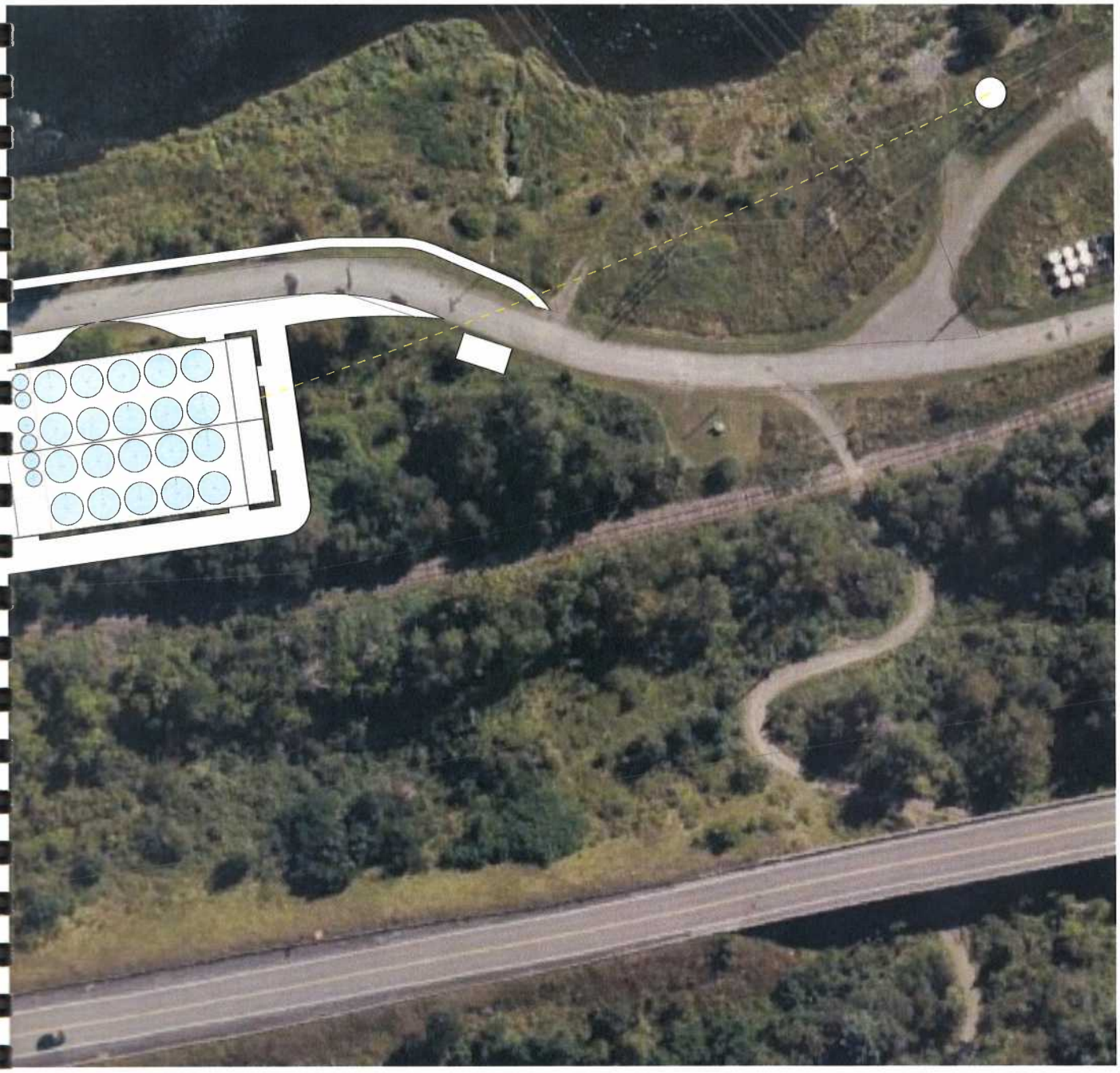
Constructed Wetland

4. Community Engagement Center

5. Shared-Use Pathway

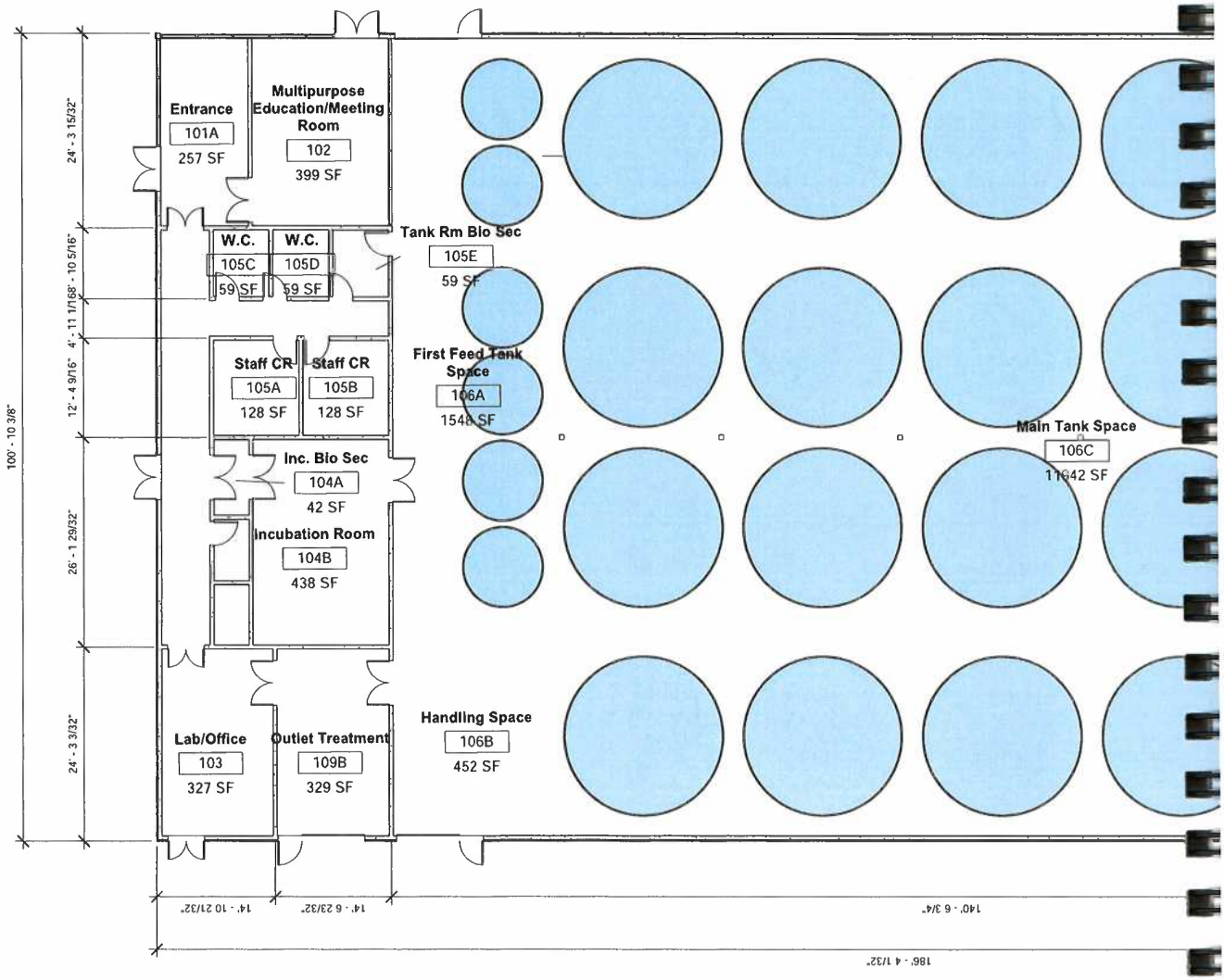


CONCEPT SITE PLAN

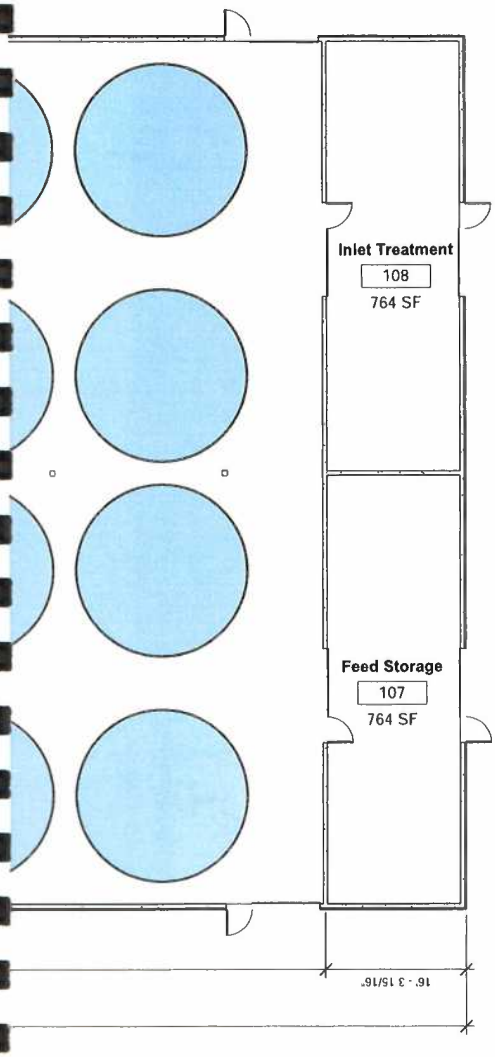


Special Sitework			
Description	Area	Cost/sf	Total Cost
Constructed Wetland	7538 SF	15	113,068
Shared-Use Path (Geo-Grid Stabilized Gravel)	8270 SF	5	41,351
Grand total: 2	15808 SF		154,419

General Sitework			
Description	Area	Cost/sf	Total Cost
Building	18419 SF	3	55,258
Building	512 SF	3	1,535
Building	283 SF	3	850
Geo-Grid Stabilized Gravel	14259 SF	5	71,297
Geo-Grid Stabilized Gravel	9960 SF	5	49,798
Grand total: 5	43433 SF		178,737


Entrance
101A
257 SF
Multipurpose Education/Meeting Room
102
399 SF
W.C.
105C
59 SF
W.C.
105D
59 SF
Tank Rm Bio Sec
105E
59 SF
Staff CR
105A
128 SF
Staff CR
105B
128 SF
First Feed Tank Space
106A
1548 SF
Main Tank Space
106C
11642 SF
Inc. Bio Sec
104A
42 SF
Incubation Room
104B
438 SF
Lab/Office
103
327 SF
Outlet Treatment
109B
329 SF
Handling Space
106B
452 SF
24' - 3 15/32"
4' - 11 1/16"
12' - 4 9/16"
26' - 1 29/32"
24' - 3 3/32"
100' - 10 3/8"
14' - 10 21/32"
14' - 6 23/32"
140' - 6 3/4"
186' - 4 1/32"

CONCEPT BUILDING PLAN



Room Schedules and Simple Cost Estimate				
Room Number	Room Name	Area	Est. Cost/Sq.ft. ($)	Est. Cost ($)
101A	Entrance	257 SF	300	77115.27
101B	Hallway	414 SF	150	62114.50
101C	Closet	34 SF	150	5122.28
101D	Closet	33 SF	150	5005.44
102	Multipurpose Education/Meeting Room	399 SF	200	79800.88
103	Lab/Office	327 SF	300	97982.91
104A	Inc. Bio Sec	42 SF	200	8360.72
104B	Incubation Room	438 SF	200	87576.55
105A	Staff CR	128 SF	200	25544.87
105B	Staff CR	128 SF	200	25544.87
105C	W.C.	59 SF	300	17566.70
105D	W.C.	59 SF	300	17566.70
105E	Tank Rm Bio Sec	59 SF	150	8783.35
106A	First Feed Tank Space	1548 SF	100	154751.07
106B	Handling Space	452 SF	100	45222.72
106C	Main Tank Space	11942 SF	100	1194234.54
107	Feed Storage	764 SF	100	76379.23
108	Inlet Treatment	764 SF	100	76429.84
109B	Outlet Treatment	329 SF	100	32852.53
Grand total: 19		18174 SF		2097954.95

CONCEPT ADDITIONAL ELEMENTS


Existing Building

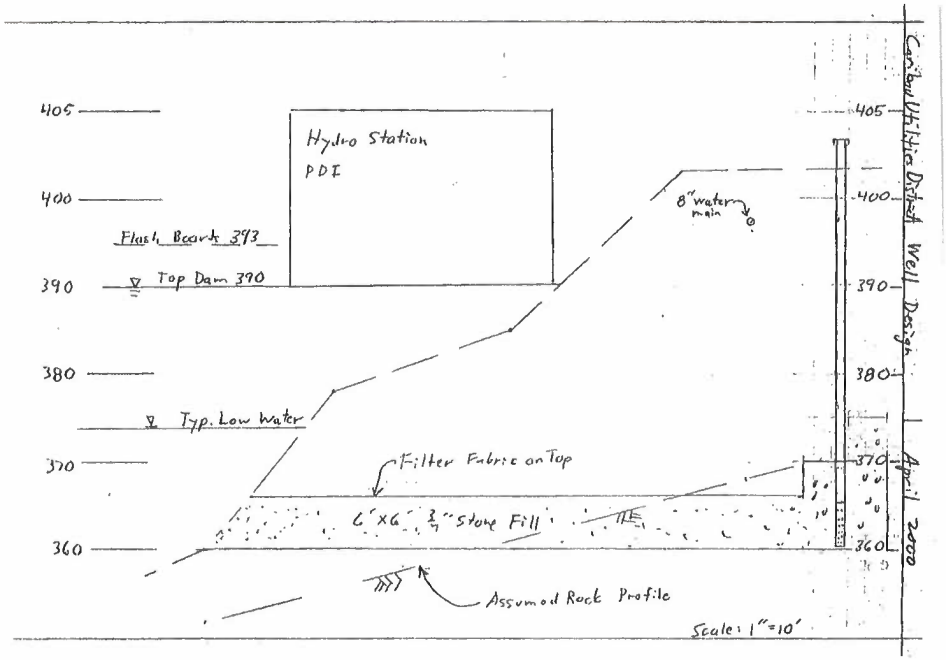

Rejuvenated Building

Community Engagement (C.E.) Center and Shared-Use Pathway

Rejuvenating the existing building on site through minimal preservative and aesthetic interventions will provide a highly adaptable community engagement center to support community activities such as farmers markets, small-scale events and education initiatives. A Shared-Use Pathway would also further the integration of the site into the community fabric. Together they provides critical community engagement while enriching the local community.

Existing Wet Wells

The existing functional gravel infiltration gallery wet wells were built as a city water source, but never used. They provide a suitable water source.



CONCEPT CONSTRUCTED WETLAND


Typical Installation

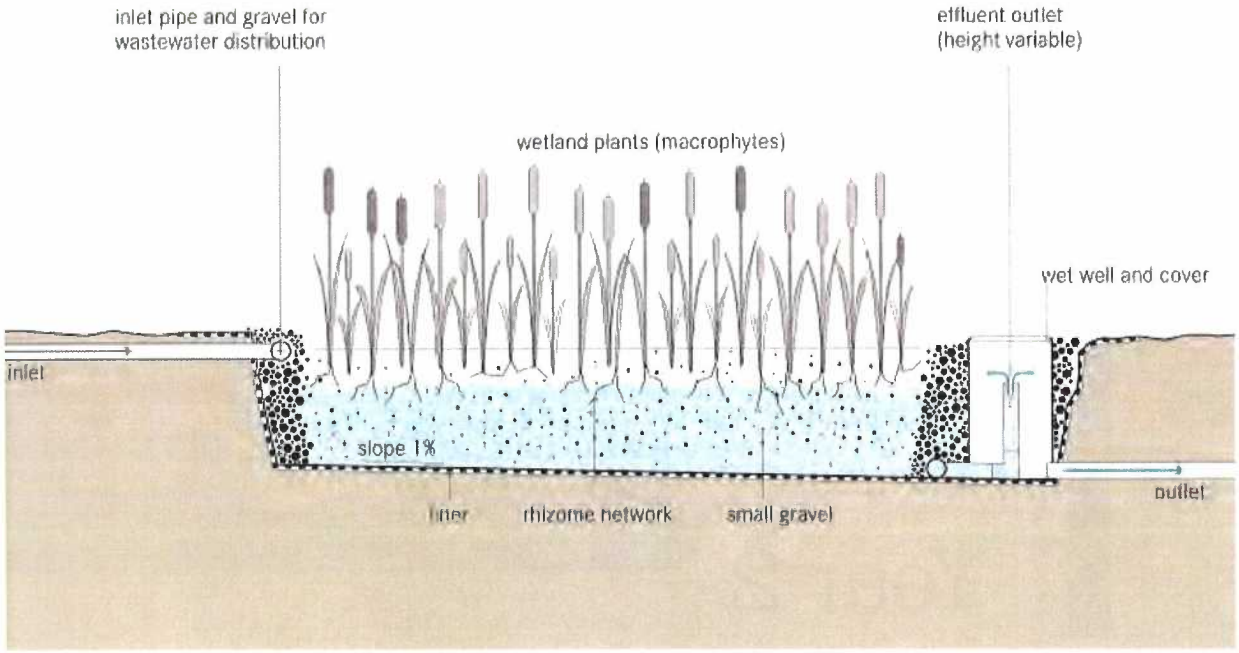

Typical Established Appearance

What is a Constructed Wetland?

A constructed wetland is an artificial wetland designed and built to treat the wastewater of the SAS Facility. Similar to natural wetlands a constructed wetland also acts as a biofilter to treat the water prior to being released into the river.

Why Build it?

A constructed wetland has numerous advantages, but chief among them is that it harnesses the natural functions of vegetation, soil, and organisms to provide secondary treatment to wastewater with a sustainable low cost method ,while providing a rich habitat for wildlife, and enriching the community fabric.



PROJECT TIME-LINE

Year 0

Planning &
Programming

Designer
Selection

Final
Design

Contractor
Selection

Construction

Year 2

Total Estimated Duration
of Project Realization:

2 Years

Conceptual Estimate

A conceptual analogous estimation based on prior similar projects. Increased turnaround may be explored utilizing a design-build approach.

PROJECT BUDGET ESTIMATE

Project Building Budget Estimate			
Main Built Components			Total cost
SAS Hatchery (not inc. systems)	See C. Building Plan		2,097,954
General Sitework	See C. Site Plan		178,737
Wet Well Connection			50,000
Contructed Wetland	See C. Site Plan		113,068
C.E. Centre Minimal Rejuvenation			100,000
Shared-Use Pathway	See C. Site Plan		41,351
Total Main Built Components			2,581,110
Additional Built Components			
Architect and Engineering Fees		12%	309,733
Contruction Management		2%	51,622
Misc. Contruction Costs		2%	51,622
Quality Control Testing		1%	25,811
Permits and Fees		1%	25,811
Value Engineering		0.50%	12,906
Other Costs		2%	51,622
Misc. and Contingency		15%	387,167
Total Project Project Building Budget Estimate			916,294
Total Project Project Building Budget Estimate			**3,497,404**

Project Hatchery Systems Component Estimate			
Hatchery Systems Main Components	No.	Unit cost	Total cost
Indoor fiberglass 20' tanks	20	16,790	335,800
Indoor fibreglass 6' dia tanks	6	2,920	17,520
Health Egg Incubators 8 trays per unit	4	2,920	11,680
Automatic feeders	26	2,920	75,920
Oxygen generator	1	70,080	70,080
Drum filter	1	33,580	33,580
Low head oxygen system	1	27,010	27,010
Fish lighting Tuneable LED/controller	26	511	13,286
Concrete pad/fencing bulk oxygen tank	1	10,950	10,950
Linde spray bars with oxygen injecton	26	47.45	1,234
PVC piping 4" sch 40	300 m	15	4,500
Oxygen 1.5 inch copper from generator	100 m	80	8,000
Valves 4" PVC	26	50	1,300
PVC couplings , elbow, T's			14,600
Drain pipe 12"	200 m	150	30,000
Oxygen fitting, flex hose, regulators			10,950
Misc. Minor Components			199,923
Total Hatchery Systems Main Components			866,333
Hatchery Systems Additional Components			
Engineering Fees		12%	103,960
Installation Management		2%	17,327
Installation Costs		30%	259,900
Quality Control Testing		1%	8,663
Permits and Fees		1%	8,663
Value Engineering		0.50%	4,332
Other Costs		2%	17,327
Misc. and Contingency		15%	129,950
Total Hatchery Systems Additional Components			550,121
Total Project Hatchery Systems Component Estimate			**1,416,454**

Total Estimated Cost of Project:

$4.9 Million

Conceptual Estimate

A conceptual estimation using itemized analogous estimations for project components to establish a base budget for capital expenditures for the project.

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