DOCKETED	
Docket Number:	21-TRAN-02
Project Title:	Recovery and Reinvestment Initiative
TN #:	237433
Document Title:	GCarbon Comments - Presentation - Wastewater to Super High Yield Agave to Ethanol & Fibers
Description:	N/A
Filer:	System
Organization:	GCarbon
Submitter Role:	Public
Submission Date:	4/13/2021 10:27:29 AM
Docketed Date:	4/13/2021

Comment Received From: GCarbon
Submitted On: 4/13/2021
Docket Number: 21-TRAN-02

Presentation - Wastewater to Super High Yield Agave to Ethanol & Fibers

Additional submitted attachment is included below.

Wastewater to Super High Yield Agave to Ethanol & Fibers

Recycling Wastewater to Produce Zero GHG Fuel & Prevent Border Water Pollution

Producing Huge Quantities of Zero Emission Ethanol Using Wastewater Now Causing Big Pollution Problems at Mexico-USA Border While Introducing New Ag. Tech. to Improve Yield, Lower Diseases

GCarbon USA

- GCarbon USA is currently involved in various ethanol projects around the world by introducing new high yield crops including an industrial sweet potato and hybrid varieties of agave and an integrated approach to using by-products to optimize value and improve life cycle carbon benefits. We expect to achieve 85% Co2 reductions with sweet potatoes and over 100% reductions with agave ethanol.

- Projects are initiated through establishing subsidiary companies in countries where the crops will grow well and in a manner that will optimize the value of the ethanol and any by-products. We have set up subsidiaries in Brazil and are in the process in Mexico jointly with GO3 Carbon.

- In Brazil we are working with a national coop we helped set up to initiate a pilot project to grow sweet potatoes hat will confirm yields in a new region of Brazil (Maranhao) where a yield of 80-100 MT/ha. (10x yield corn) is expected to produce 15-17,000 liters/ha. of ethanol (4x yield corn, 2x cane)

- In Mexico we are working with a water-wastewater and ozone partner of many decades on a project to recycle industrial wastewater for industrial re-use while moving all of the municipal wastewater after treatment to the desert to grow very high yield agave. The current generation of hybrids is able to produce at least 1000 MT per ha after 5 years (140 MT/ha/year) and next generation hybrids possibly increasing yield to 3500 MT per ha.

GO3Carbon, Diatomaceous Mine, Equip. Conservadores

- GO3 Carbon is currently involved in medical and building ozone projects in the USA including seeking Emergency Use Authorization for medical ozone and working on various applications for ozone in treatment of acme and other skin diseases and combining ozone technologies for water and wastewater treatment with biological treatment using agave to make ethanol

- In Mexico we are working with Lorenzo Payan & Equipos e Conservadores on using ozone and electrolysis to separate chemicals from wastewater and re-using chemicals. This same process will be used to improve efficiency of municipal wastewater plants and lower operating costs.

- We are also working jointly on a program to improve the efficiency of agriculture by adding diatomaceous earth and using ozone at the root level to reduce diseases and improve yields. Mr. Payan has a diatomaceous earth mining company in Baja California that will provide this product to farmers at a price that is justified by the doubling of yields of agriculture.

- We will separate industrial chemicals at the source (industrial parks) so there is no more contamination of wastewater with high chemical loads and treat this wastewater so it can be used for agriculture including the waste nutrients (by keeping toxins out of sludge and sterilizing it). In parallel we will introduce high yield organic agricultural technologies to farmers so they use land efficiently.

GO3 Carbon CalMexar

- GCarbon CalMexar is being formed to introduce high yield hybrid varieties of agave to produce ethanol. This is being done in conjunction with identifying opportunities to use municipal waste water for irrigation and fertilization and in parallel eliminate serious problems with water pollution.

- We have focused our initial efforts in Tijuana and Mexicali in conjunction with presenting a plan to the to the US EPA to USA on how to spend the $300 million USD that is included in the Mexico-USA trade agreement for cross-border water pollution. The plan is being reviewed by an independent consultant hired by US EPA and focuses on control systems and benefits of spending the money in Mexico.

- We are developing a study proposal for the US EPA that will involves wastewater sampling at industrial parks while testing new technology that will allow both chemical and water recycling in parallel with a pipeline right of way and land availability study that looks at where agave can be grown using wastewater and other uses for irrigation water in agriculture

- The goal is to make sure that most of the wastewater that is untreated via rivers that flow into the USA or the Pacific ocean is treated and then put in large pipes and moved to agricultural areas to produce energy crops or solve silt or salinity problems. This will create hundreds of millions of gallons of ethanol, double the yields of various agricultural crops, create tens of thousands of jobs from agriculture, fuel & composite manufacturing and revive the economies on both sides of the border

Managing Wastewater in Tijuana; Creative Solutions

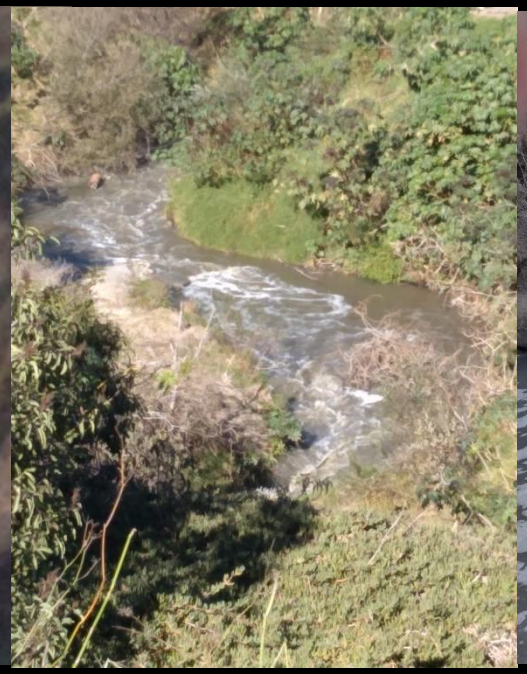
164 million gallons/day of polluted water = means to grow agave & other crops

- Tijuana sewage plants are having problems operating properly because of chemical spikes from illegal dumping by industry or other impacts on capacity utilization.

- Discharge of wastewater is supposed to be limited to 1100 liters per second to the US side but often exceeds this amount. In Mexico another 2500 liters per second is exiting the San Antonio de Los Buenos plant and another canyon in what appears to in a poorly treated state to the Pacific. The result is at least 3600 liters per second of raw sewage entering the Pacific or crossing into the USA. The International Boundary Water Commission can only handle 1000 to 1500 liters per second so the rest enters the ocean untreated

Limited Treatment of Sewage in Tijuana Needs a Solution

2500 liter per second of sewage with limited or no treatment from 2 canyons next to Pacific



- We conducted an informal assessment of two discharge points into the Pacific from streams originating from wastewater plants that appear to either be operating very poorly or that were never completed that result in poorly treatedwastewater
- The combined flow of the two sources of about 2500 liters per second is one of the major causes of water pollution on San Diego and Tijuana-Rosarito beaches and few people understand where the discharges are coming from
- We are suggesting in our study specific solutions to improve the treatment capacity and improve the water quality from these two sources so we can eliminate one of the very important sources of water pollution affecting Pacific beaches.

Managing Wastewater in Mexicali; Problem = Solution

80 million gallons/day of less than ideal treatment of sewage = means to grow agave/other crops

- For a variety of reasons there is about 1000 liters/sec. of water in New River that does not meet water quality standards and is creating serious health problems on both sides of the border from diseases caused by sewage microbes in the air.

- The solution lies in diverting all wastewater after treatment to the desert to grow agave and thereby avoid any water with poor water quality standards from reaching the US side. This water now going to waste will instead be treated to avoid smell and kill microbes and will provide water to create a new feedstock for producing zero emission transportation fuel.

Wastewater Plant Sludge- Solid Waste Problem & Green Solution

Sludge from waste treatment plant now gets dumped back in TJ, flows to ocean

La mezcla de aguas residuales químicas y biológicas da como resultado un lodo tóxico que debe ser gestionado por la planta de aguas residuales. No es posible utilizar el lodo porque está lleno de sustancias químicas cancerígenas. La planta de aguas residuales de la Comisión Internacional de Aguas Fronterizas ahora envía este lodo a través de la frontera a Tijuana, donde se entierra con controles mínimos. Los lodos también provienen de las plantas de Tijuana.

Las instalaciones de almacenamiento a menudo dejan escapar lodos al océano cuando llueve mucho. Nuestra solución consiste en tratar los desechos químicos de las plantas industriales en la fuente y devolver los químicos a las plantas para su reutilización, lo que luego da como resultado un lodo no tóxico que consiste principalmente en desechos humanos. Con un tratamiento adecuado, como biogás o energía solar, podemos reutilizar este lodo en la producción no alimentaria de etanol y reducir las emisiones de carbono.

USA Tijuana Proposed Solution: Expand USA-IWTP

USA Engineering groups proposing to expand capacity to164 million gallons/day = $400 milion

Current capacity of IWTP is only 25 million gallons per day (1100 lit./sec). Proposal of engineering companies in USA is to expand the capacity of the IWTP to 164 million gallons per day so they can divert the entire Tijuana River except 15 days/yr.

There are four major problems: 1) Cost: Estimated cost is $400 million which is $100 million more than total 4 yr. funds
2) Feasibility: Spikes in chemical wastewater loads means it is very likely it will have problems as use anaerobic digestion
3) Supply: Tijuana could recognize the value of recycled wastewater leaving the asset stranded with no wastewater to treat
4) Only Part of Problem: Cleaning up discharges from Tijuana River only part of the problem in Tijuana, never mind Mexicali

Mexico Solution = Reduce, Reuse, Recycle

Go3 Carbon CalMexar Proposing Industrial Wastewater Recycling of Muni Wastewater to Agave

REDUCE INDUSTRIAL WATER USE: We will work with industrial parks in Tijuana and Mexicali to reduce their water use by providing recycled water from on site treatment plants and reuse of chemicals

RECYCLE INDUSTRIAL WATER & CHEMICALS: Treatment process will result in clean water for reuse in industrial process and chemical concentrates that can be reused in industrial process. This will recycle chemicals and water, lower costs for industry & reduce water use.

REUSE OF WASTEWATER TO GROW AGAVE: With chemical wastewater eliminated it will be possible to treat human wastewater and re-use treated wastewater since any biological residuals and water will be used by agave & other plants to meet nutrient and liquid requirements.

NOW: Hexavalent Chromium as discharge
Major source of cancer & birth defects

FUTURE: Chromium Acid for reuse
Clean water for industry reuse

NOW: 264 million gallons/day raw sewage discharging to US border and most to ocean

FUTURE: wastewater is sent to desert to grow potatoes/agave & 156-583 million gal/yr. ethanol (with some water for reuse by grapes)

Health Cost of Wastewater Treatment:

High Incidence of Intestinal Diseases, particularly in Mexicali which is only 2/3rds of the Population of Tijuana

Table 3

WATERBORNE DISEASE STATISTICS FOR MEXICALI, B.C.

Disease	No. of Cases					
	2014	2015	2016	2017	2018	2019
Intestinal diseases other organisms	46,278	48,070	39,222	47,917	43,640	37,768
Typhoid fever	920	1242	644	961	636	318
Other salmonellosis	621	783	641	569	322	285
Intestinal amoebiasis	1,317	959	547	554	501	215
Scabies	174	211	195	347	280	293

Source: Ministry of Health, Epidemiological Monitoring Coordination Unit, General Morbidity, New Cases in Mexicali (ISSESALUD de BC).

TIJUANA: No. of Cases						
Disease	**2005**	**2006**	**2007**	**2008**	**2009**	**2010**
Intestinal diseases by other organisms	36930	33084	31858	34354	33966	34312
Other Helmintiases	1812	1651	1928	1679	1586	1802
Intestinal Amoebiasis	1715	1636	1202	1179	1178	1006
Scabiosis	1187	1275	2103	1105	840	938

Table 2.1 – Waterborne Disease Statistics for Tijuana, B.C.
Source: Secretariat of Health, Epidemiological Surveillance Coordinating Unit, General Morbidity, New Cases. Tijuana 2005-2010

Economic Costs & Opportunities with Water & Wastewater

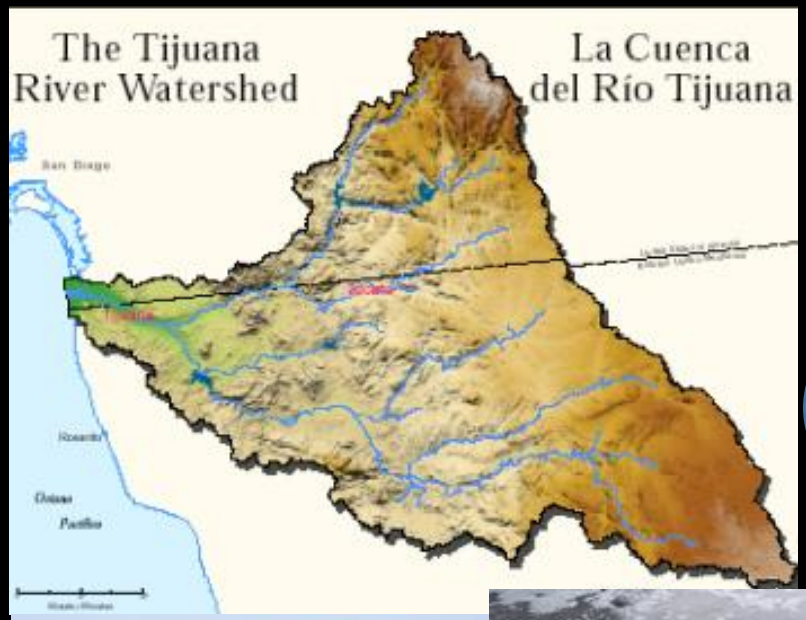
Closed Beaches or rising real estate values are possible depending on choices made

San Diego County monitors beaches and water quality and is regularly closing beaches due to water pollution levels getting too high. This negatively impacts all beach based businesses

Closed beaches can impact the real estate values for commercial and residential property on both sides of the border as a result of water pollution that is affecting quality of ocean and river water and that leads to smells and illness.

Much greater real estate values can be realized if both water shortage and water pollution problems are addressed together. We will solve both problems by recycling of industrial water and by re-routing wastewater treatment discharges to the desert.

A major growth in real estate values can occur in the region if there are clean beaches, no water pollution and additional fresh water resources for new housing and commercial projects. This is possible if 1600 liters per second of industrial water is recycled because this water is then available for industry, commercial and residential growth.



Growth is limited by lack of water

Solution is to re-use wastewater

Industrial Water & Chemical Recycling

The Key Solution

Proposed Chemical Recycling Plant La Morita

Industrial parks in Tijuana can recycle water & chemicals to improve sustainability, save money

- Current La Morita waste water treatment plant is small but there is a lot of land that would allow for adding water & chemical recycling.
- Plant is right next to two main industrial plants in Tijuana that will allow it to handle about 50% of chemical wastewater. Chemical recycling plant will be able to handle wastewater from Pacific Industrial Park and Florida Industrial Park. This is a combined treatment of 1200 liters/second (104 million liters/day, 27 mil gal./day)
- We will add ozone and electrolysis to undergo initial separation of chemicals and water and then undergo more refined treatment using flocculation, sedimentation, filtration & reverse osmosis
- The main objective is to reduce costs for industrial parks by reducing the volume of water needed daily and by providing recycled industrial chemicals or chemical acids. This will sharply reduce operating costs and provide a strong justification for participating in the project.

Chemical Recycling At each Plant Like La Florido

Chemical & Water Recycling could occur in existing CESPT collecting point in industrial park

- Another alternative is to treat chemicals at each industrial park. There is an existing collector area for wastewater owned by CESPT in El Florido Industrial Park. This facility could be upgraded to a recycling facility for wastewater and chemicals and would simplify returning recycled water to the industrial park
- We will evaluate a specific retrofit plan for this space and consider the building requirements and how to use the existing infrastructure to build out the recycling facility
- This collecting infrastructure exists in some of the other industrial parks and offers opportunities to use existing infrastructure to build out new treatment facilities without having to use industrial park land.

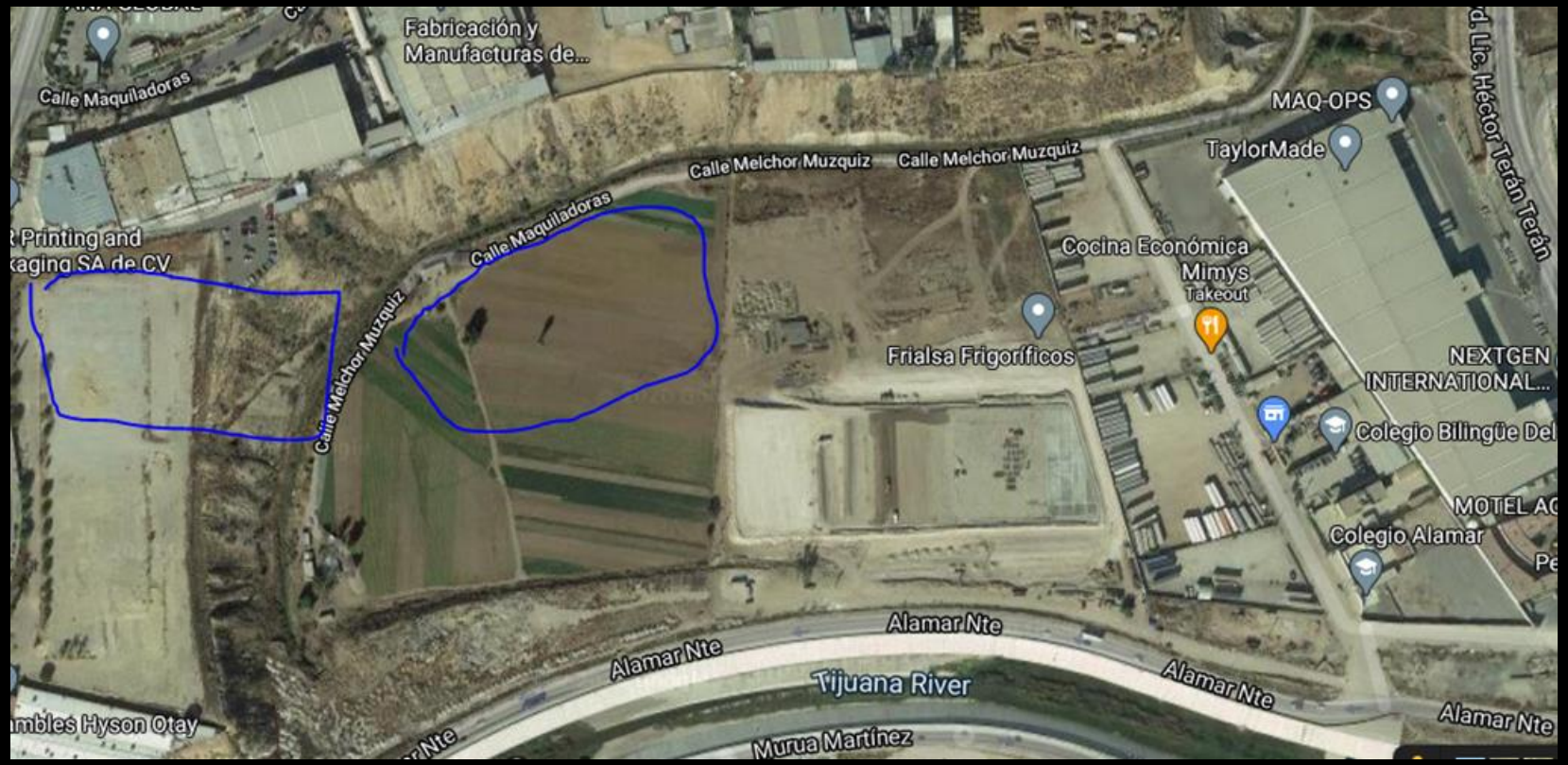
Chemical Recycling Plant Otay Industrial Parks I & II

Industrial parks in Otay Mesa Can Set Up Wastewater Treatment on Their Own Land

- There is no waste water treatment plant near the Otay Mesa Industrial park so we will propose that solution to the industrial park and set up a plant on their land.
- Water and wastewater treatment will use same approach of ozone and electrolysis to undergo initial separation of chemicals and water and then undergo more refined treatment using flocculation, sedimentation, filtration & reverse osmosis
- Plant will be able to treat 900 liters per second or 78 million liters per day (20.5 million gallons) and avoid about 19% of the wastewater from entering the main wastewater treatment plants from recycling efforts
- The recycling of wastewater back to the industrial park will free up fresh water for other industrial customers or for other uses by the City of Tijuana. This will have very positive economic development benefits.

Site for Chemical Recycling Otay Mesa Ind. Parks I & II

Industrial parks in Otay Mesa Can Set Up Wastewater Treatment on Their Own Land



- Location of Chemical and Water recycling plant South end of Otay Industrial Parks 1 and 2
- Plant will be able to treat 900 liters per second or 78 million liters per day (20.5 million gallons) and avoid about 19% of the wastewater from entering the main wastewater treatment plants or Tijuana River

Major Corporations in Tijuana's Otay Industrial Parks

Tenants at the Otay and Other Industrial Parks are some of the largest companies in Mexico

Otay Industrial Park I

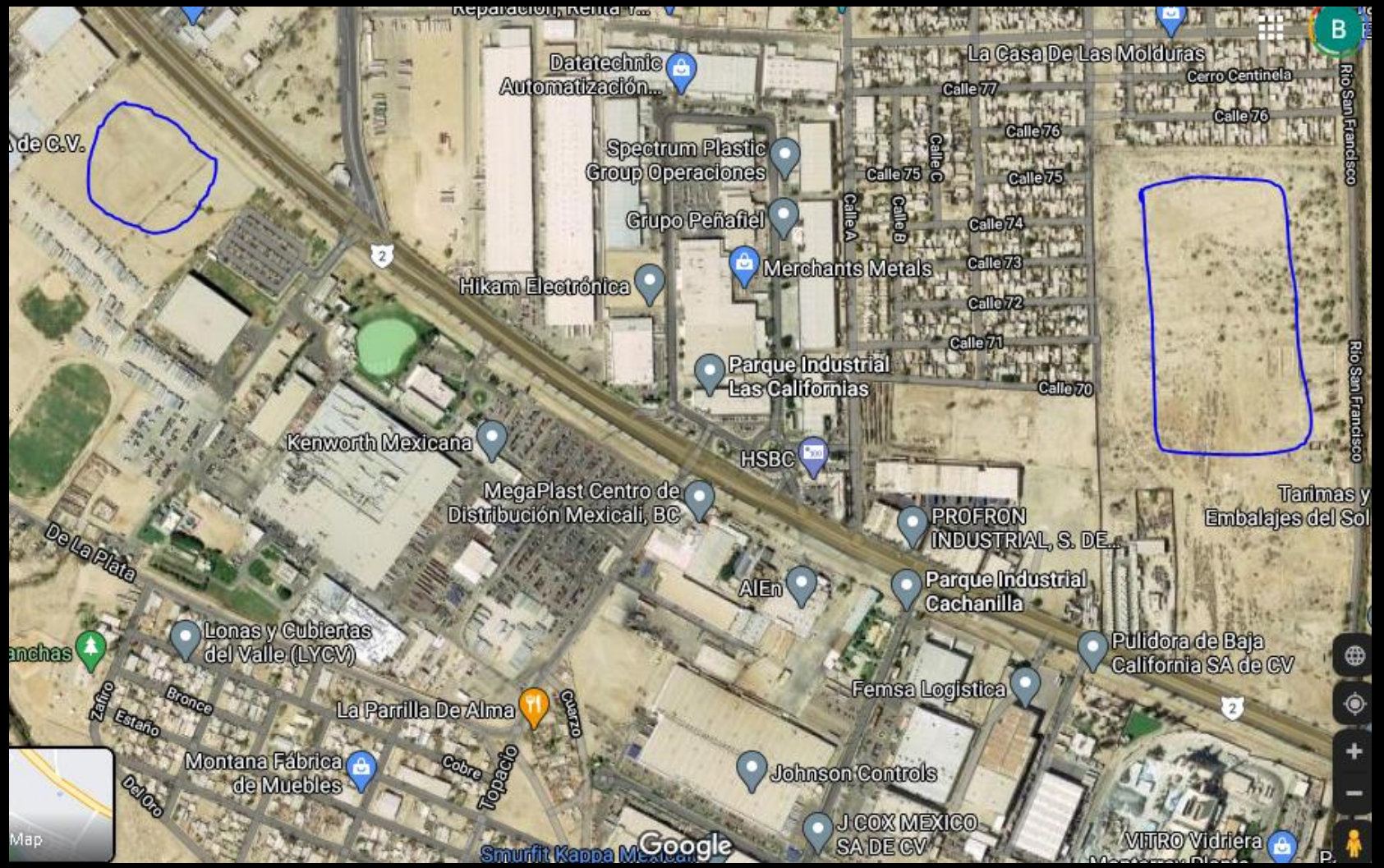
Nypro A Jabil Corp
Atrastes de Tijuana
Bose Corp.
Stretch Film
Harbor Packaging de Mex
Bali Express Services
Turbotec
Ontex
Ryder Capital
Eaton Electrical
B& B Plastics
Watkins Manufacturing
Neotec
Poly
Integer
Tapicejas Pacifico
Appliances Refrigeration
Mi Tecnologies International SA de CV
Great batch Medical Portable
Brady Corp.
Mecalux
Cummins de Baja
CEDS TZL
Arcosa Mequeladora
TCL Moda Manufacturing
Parker
UNO Pte.

Otay Industrial Park II

Panasonic Ecology Systems de Mexico
Schneider Electric Nave 6
Sanko Electronica de Mexico SA de CV
Panasonic Otay
Mutsutech SA de CV
Roberts Enterprises
Sumitronics Manufacturing
Alimacamento y Logisticos
Servicio Panamericano de Protecion
Guarderia Suenos y Sonrisas Mex.
Prime Wheel Mexico
JD Group Total y Logisticas
Herdez SA de CV
Next Gen International
Industrial Alamar
Banamex
Ken Mex

Mexicali: Parque Industrial Las Californias

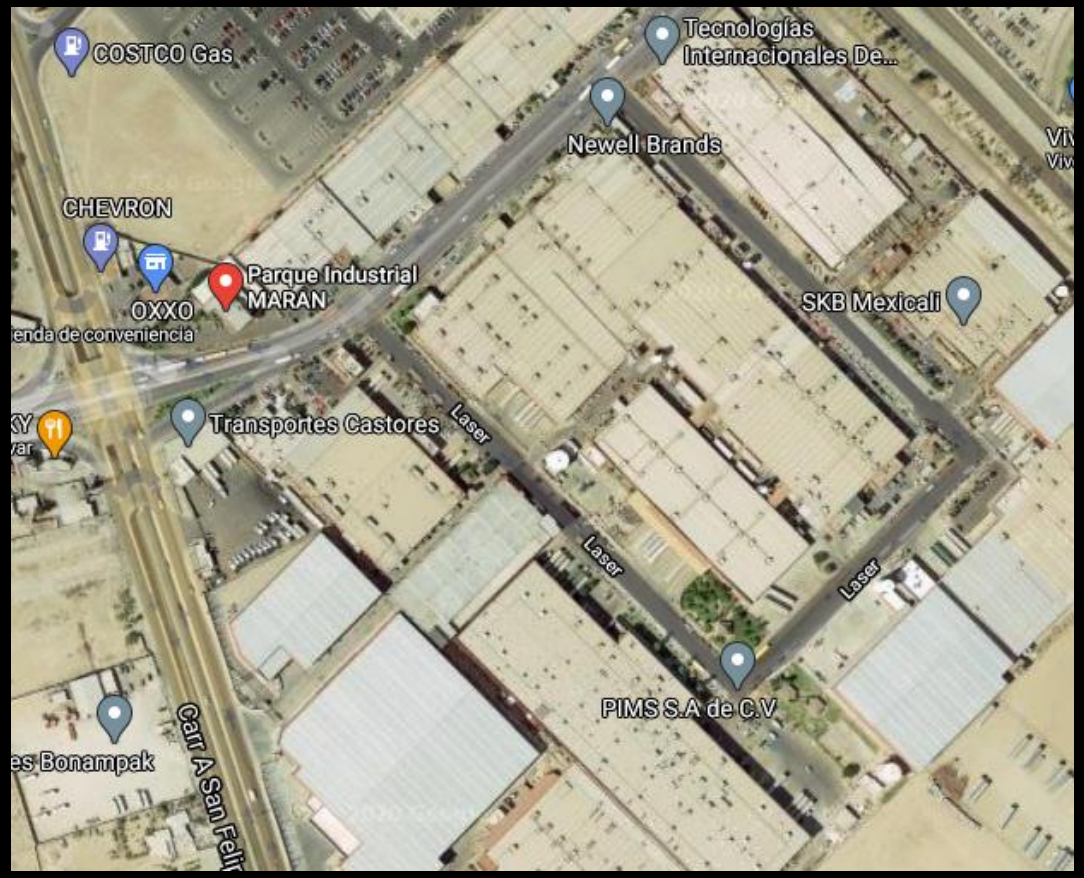
Industrial parks in Mexicali Can Set Up Wastewater Treatment on Nearby Land



Plant can be set up to recycle up to 90% of the water entering the plant and return industrial water and chemicals and solvents that can be reused in industrial processes.

Mexicali: Various Industrial Parks Close Together

Industrial parks in Mexicali in some areas are close so Wastewater Treatment Can be done jointly



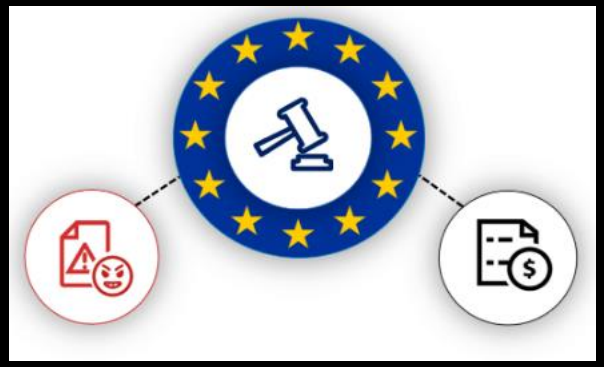
Group of Industrial Parks with Ability to Link Together

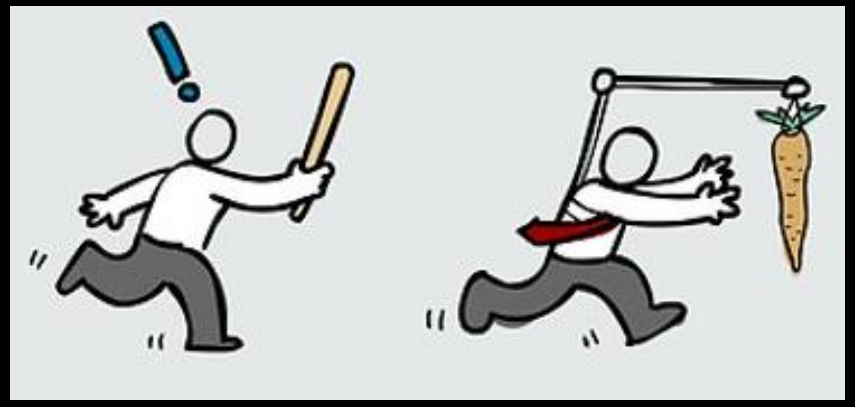
Parque Industrial de Maran

Concept in Mexicali is to link industrial parks that are near each other to dedicated pipes that lead to an industrial water and chemical recycling plant. Funding for replacing pipes that is already in place makes timing ideal. Chemicals can be returned by truck and water after treatment can be used for irrigation to grow agave.

Ind. Parks may have to pay if pollute, could save $ if recycle

Fines by CA on Cities Could Mean Fines for Industrial Parks – Carrot is $ Savings on Water & Chemicals





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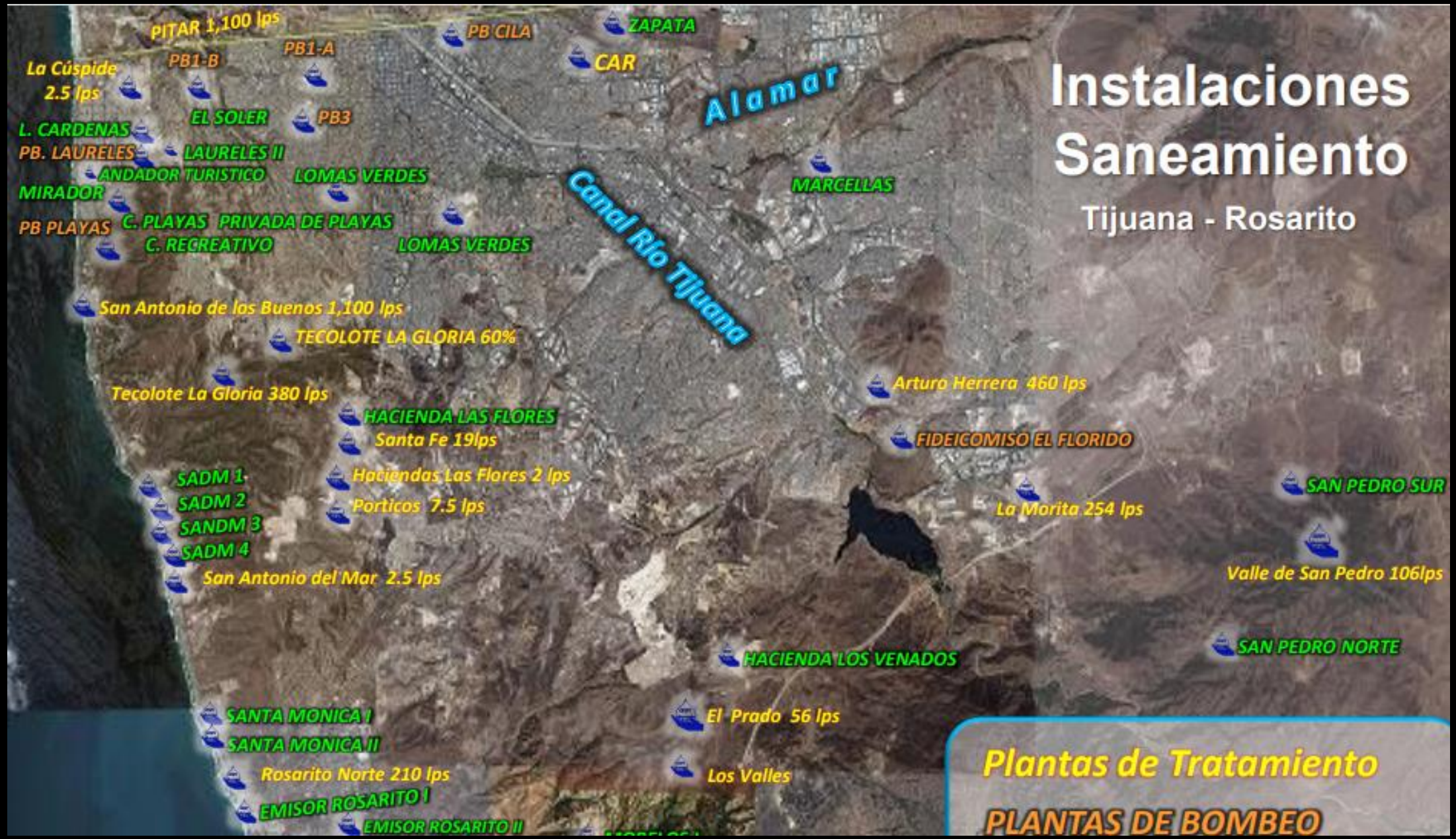
- State of CA & City of San Diego is threatening to fine the City of Tijuana for causing pollution in the Tijuana River and Pacific Ocean through court cases. If fine occurs industrial parks could be fined for pollution by TJ. Similar opportunity for imposing fines on Mexicali by Imperial Irrigation District, State of CA, Imperial Valley Cities
- The alternative to continuing to pollute is to participate in water and chemical recycling project that can save companies $$ on chemicals and water costs and improve sustainability.
- We are approaching various major companies in the industrial parks to discuss the cost of inaction and the benefit of participating in the project as a means to improve health & environment

Overview: Wastewater Facilities in Tijuana Region

Waste Treatment, Pumping, Current Waste Flows

Wastewater Plants & Pumps in Tijuana CESPT System



Tijuana- Rosarito Wastewater Plants

Wastewater Plants in Tijuana & Rosarito:

Description of Tijuana Plants	Wastewater Capacity and Effluent Volume
San Antonio de Los Buenos	1100 liters/sec., 95.0 mil. liters/day (25.1 mil. gal/day)
Arturo Herrera (insurgentes)	460 liters/sec../sec., 38.9 mil. liters/day (12.3 mil/gal/day)
La Morita & El Refugio	254 lit./sec originally, expanded to 800 liters/sec.., 69.1 mil. liters/day (18.3 mil/gal/day)
El Prado & Los Valles	80 liters/sec., 6.9 mil. liters/day (1.8 million gallons per day)
Punta Bandera	380 liters/sec., 32.8 mil. liters/day (8.7 mil/gal/day)
Valle de San Pedro	106 liters/sec., 9.3 mil. liters/day (2.4 mil./gal./day)
Tecolote La Gloria	127 liters/sec. (plus new plant that is 60% completed) (capacity estimated at 600 liters/sec.)
Santa Fe, Portico, Hacienda	30 liters/sec., 2.6 mil. liters/day (685,000 gal/day)
Rosarito Norte, Sul, otras	378 liter/sec., 32.7 mil. liters/day (8.6 mil. gal./day)
TIJUANA-ROSARITO TOTAL	**3461 liters/sec., 298.5 million liters/day (79.0 mil./gal/day)**
USA IBWT PITAR	**1100 liters/sec., 95.4 million liters/day (25.6 million gallons per day)**
UNTREATED TOTAL	**600 liter/sec. (with goal to treat this water through completing plants, system improveme nts)**
Potential Flow Reduction:	Up to 90% or 1660 liters/sec., 143 mil. liters/day (37.9 million gal./day)
From Industrial Recycling	(from chemical waste treatment and recycling of treated water).

Flow Increases Expected: Un-hooked population and increased industrial activity will offset reductions before pipeline built

Liters for Biological Systems: 4000 liters/sec., 346 mil. liters/day (some water now untreated, TJ municipal plants, IBWT?)

Proposed Improvements: Ozone and electrolysis added to existing biological treatment tanks after eliminating chemicals
Better management of infrastructure and upgrades to equipment, completion of La Gloria
Piping of wastewater plants to desert in Las Palmas and east

Wastewater Plants in Tijuana CESPT System

Plantas de Tratamiento

Punta Bandera
380 liters/second

Rosarito Norte
210 liters/second

Rosarito I
160 liters.sec.

San Antonio del Mar
2.5 liters/second

Santa Fe
19 liters/second

Port de San Antonio
7.5 liters.sec.

Wastewater Plants in Tijuana CESPT System

Wastewater Plants in Tijuana CESPT System

Wastewater Pumping Stations & Canals in CESPT

Historical Treatment Volumes

Wastewater capacity is not keeping up with demand

Fresh water 2012 5800 liters/sec. and wastewater is 2700 lps in 2012. Industrial treatment was 1600 lps with at least 25% was untreated in 2012.

Since then treatment of wastewater has not met Mexican water standards with high contamination according to independent scientific reports and testing by independent labs

Some treatment capacity remains incomplete (Tecolote La Gloria) which appears to result in 600 lps of untreated waste going to Pacific Ocean

Additional wastewater appears to be untreated coming from San Antonio de Los Buenos and/or from illegal settlements discharging directly

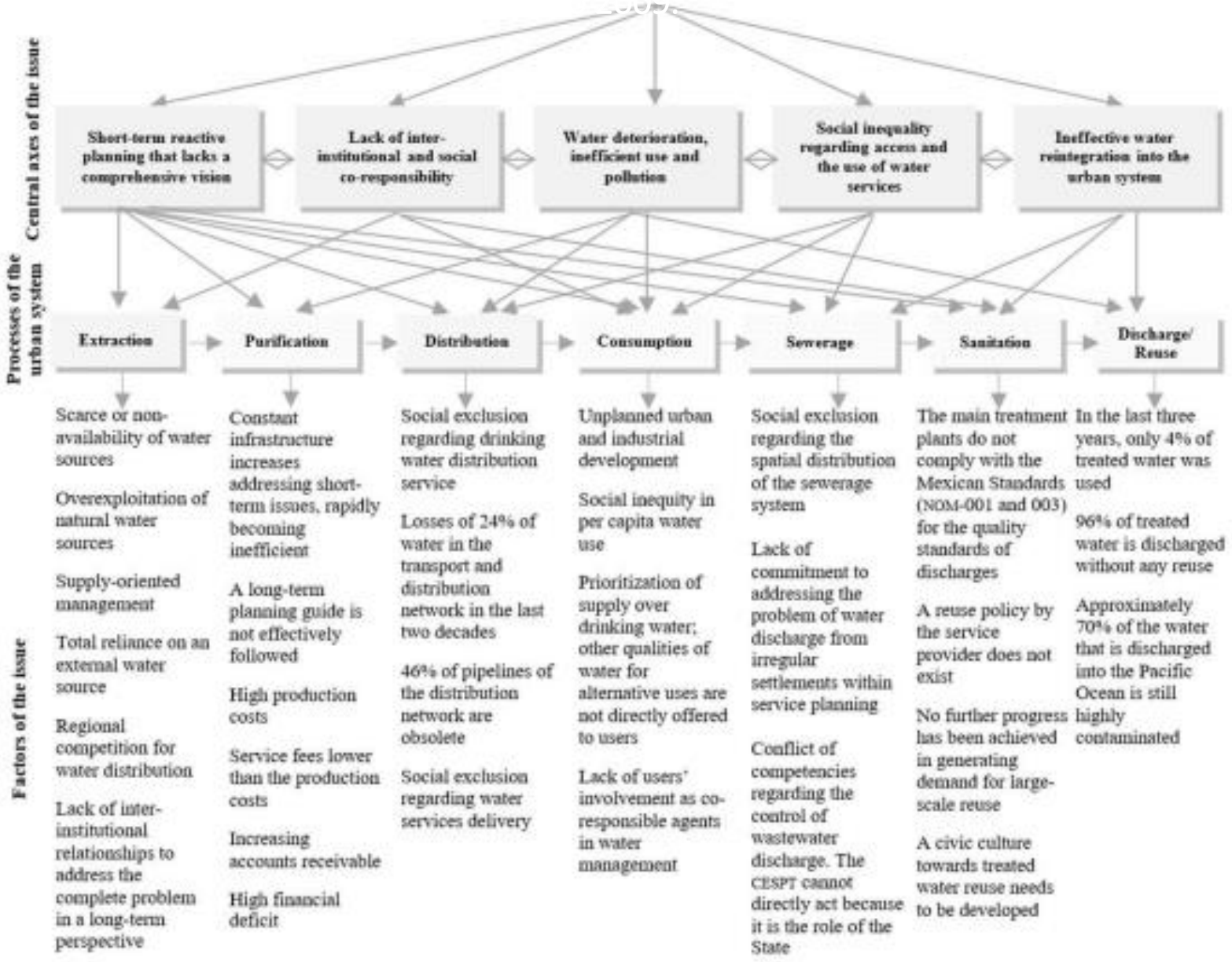
Studies of Issues

3rd Party Report in 2014

- Scarce or non-available water sources
- Service fees lower than OPEX-CAPEX
- Bureaucratic barriers to efficiency
- High financial deficit ongoing basis
- Loss of 24% water in transp. & distribution
- 46% of distribution pipelines are obsolete
- Unplanned urban/industrial development
- Illegal industrial discharges at night
- Social exclusion regarding water delivery
- Main treatment plants do not meet standards at various times in the year
- A reuse policy by service providers is limited with only 4% reused
- 96% of wastewater discharged with no use
- At least 70% of discharged wastewater does not meet water quality standards
- Strong reliance on USA to treat wastes

Figure 3. Axes and critical factors in the unsustainability of Tijuana's water supply

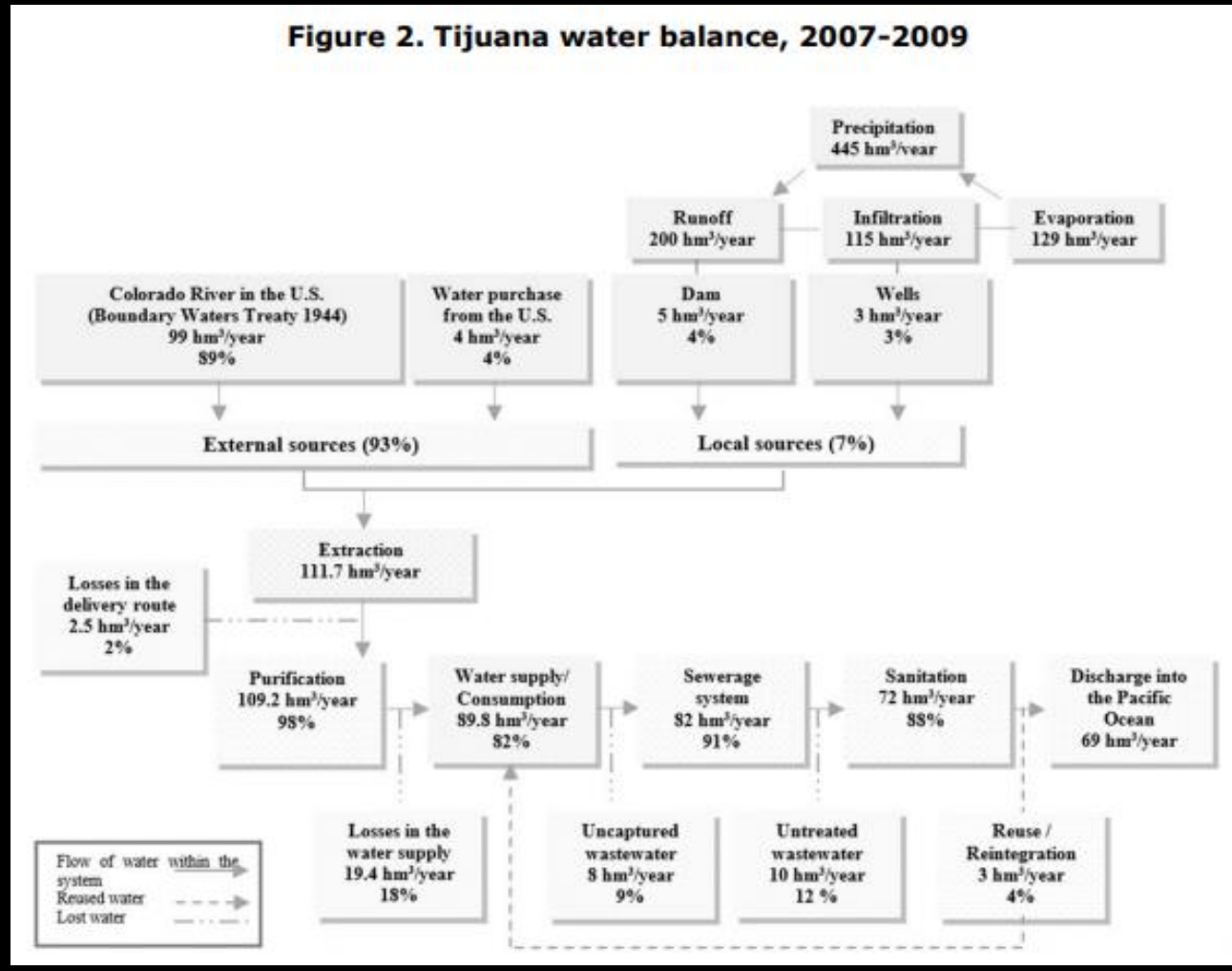
2014 study of water management in Tijuana By Karina Navarro-Chaparro, Patricia Rivera and Roberto Sanchez



TJ's Main Water Supply of Colorado Rivers is Shrinking

89% of Tijuana water comes from Colorado River and supply shrunk 15% recently
Wastewater system is not working well and causing pollution problems, no re-use

- Colorado River Tijuana Aqueduct is now being fully utilized at 5300 liters per second and supplies 89% of Tijuana water
- Climate change and a major drought have reduced Colorado river flows and Mexico share has gone from 1.5 to 1.3 million acre feet. This is a reduction of about 15%.
- Well water increases are not sustainable as a result of salt water incursion into aquifer (already happening in Guadalupe)
- Other supply options for fresh water are very expensive including water purchase from USA, building new dams or installing desalination units
- Tijuana in 2009 was losing 20% of its water supply from leakages in the transmission system. Situation similar now
- Wastewater systems to manage 5900 liters/sec of water flows is not sufficient and leads to at least 23% of wastewater not being treated in 2009 with the % & higher volumes today
- Illegal settlements have no water or wastewater service or hook up illegally, leading to high water costs & untreated waste
- Result is shrinking supply of water and some untreated wastewater hitting beaches of Rosarito, TJ, San Diego



Water Services Losing Money – Need A Fix

Fee Collection does not match costs, no reuse, difficult to raise funds to fix system

- A study of water management in Tijuana was completed by Karina Navarro-Chaparro, Patricia Rivera and Roberto Sanchez in 2014 based on CESPT and other data from 2005 to 2009. Data provided by CESPT indicated that revenues decreased significantly from 2004 to 2009 due to declining water sales. This is although the number of accounts increased in the same period and is explained by the decrease in consumption per user.

- Accounts receivable increased by up to 16% annually and far collection efficiency decreased to only 55% of what was charged leading to a loss of more than 2 billion pesos in this period. Unlike the USA, Mexico does not allow cut off of water services.

- In 2005-2009 the cost to CESPT to supply a cubic meter of drinking water was 27.52 pesos. However, CESPT only recovered 16.24. This means revenue from drinking water represents only 60% of costs. Water sales that are below the cost lead to a long term lack of funds that has a direct impact on system expansion and maintenance

- Individuals with fewer economic resources end up paying more for water, particularly when they are delivered by truck in neighborhoods that involve illegal housing. There's usually no sewer services in these homes, leading to high water pollution

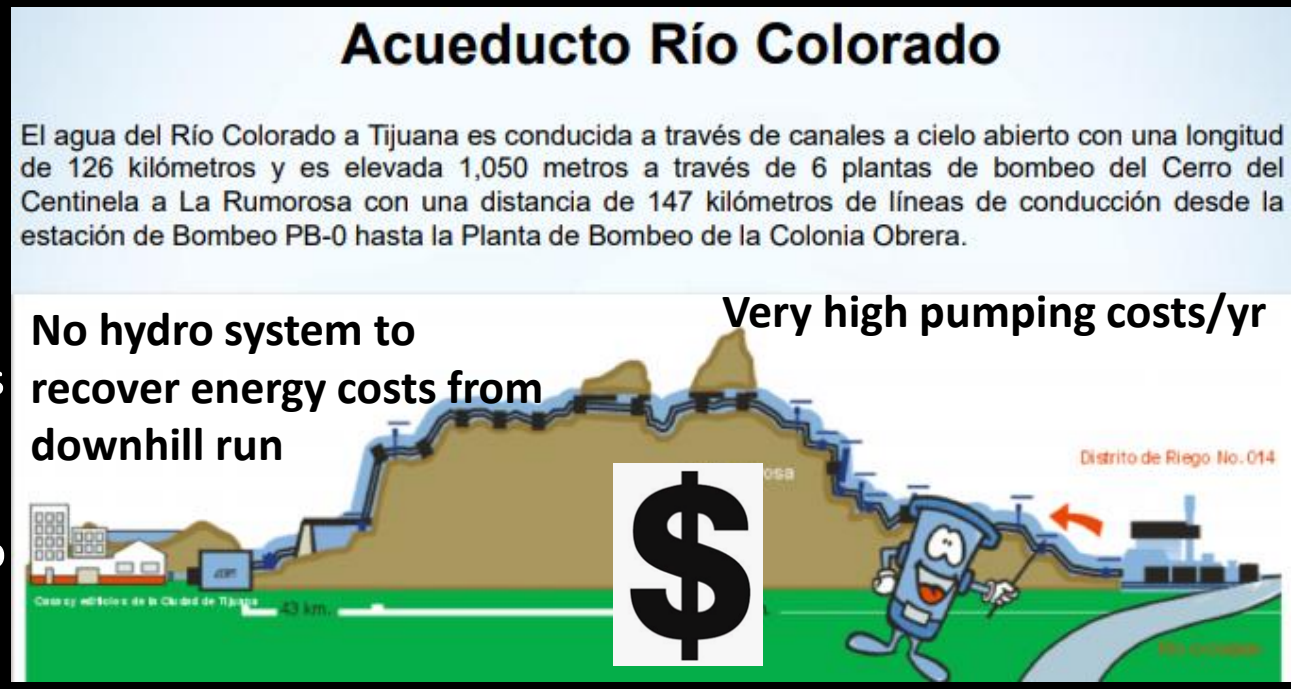
- Tariff structure does not include the total costs for sanitation serv ices and these services are not broken out in the bill.

- The low cost of water means there is little incentive to conserve water. The lack of monitoring of sewar discharges means there is little incentive to clean-up wastewater discharges or to enter into re-use agreement. Yet this is exactly what is needed to free up water for other uses and to provide water services in a period of drought and with a growing population.

Supply of Water from Colorado River = Big Hill Climb

Lack of energy recovery leads to High electric cost for water & wastewater

- Colorado River Tijuana Aqueduct is 126 Km and has to pump water 1050 meters up hill. The 6 pump stations consume 3.5 pesos percubic meter on 5.3 cu. meters/sec. = $30.8 mil. USD
- There is no hydro facility on the downhill run to recover energy lost from the pumping of water uphill, adding to inefficiency
- This cost is higher per delivered liter of water since 20% is lost from leaking water pipes with no revenue generated from sales
- Wastewater mostly drains to the bottom of the Tijuana river where it is then pumped 800 meters vertically uphill to Punta Bandera. This costs 2.9 pesos/cubic meter on 2 meters/sec. so annual cost is $9.6 million
- Combination of pumping costs for fresh water & wastewater (at least $40 million USD)= large % of revenue spent on elec.
- Lack of operating funds means that no funds are spent on repairs of pipes, replacement of distribution system, operation of wastewater plant which then leads to high pollution levels
- Costly alternatives for adding supply coupled with shrinking Colorado river supply means water-wastewater system is in serious trouble. Failure to treat wastewater is leading to serious potential liability with City-County SD and California

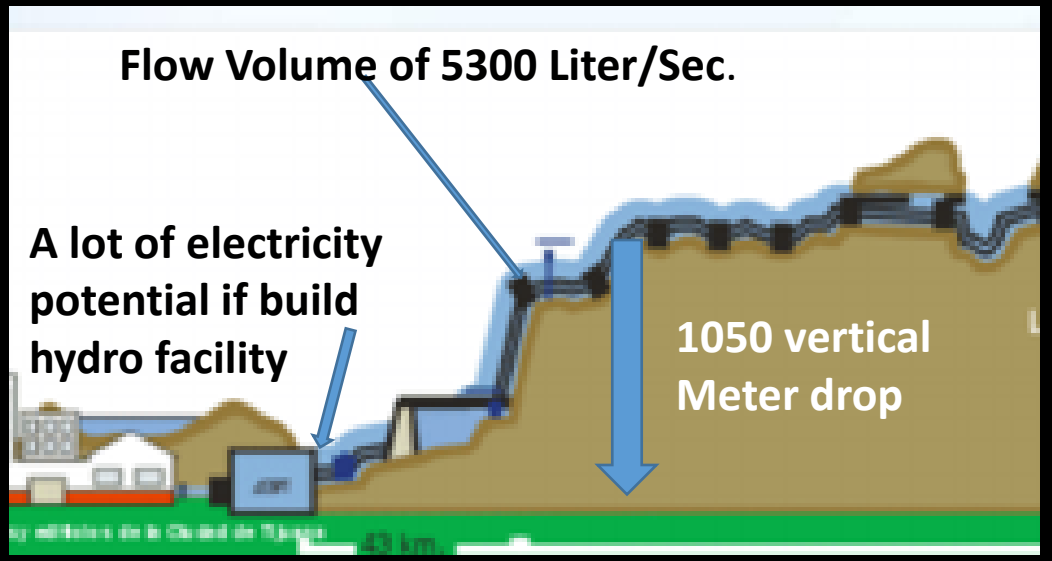


Pumping fresh water uphill=$31mil USD
No energy recovery downhill
Pumping wastewater uphill=$9.6 mil USD
20% leakage in system= lost pump $$
No money left to operate waste plants
At least 25% of waste is not treated
Large # of poor people unconnected
Options to add water capacity expensive
Water recycling rate very low (4%)

Large Potential for Hydro System on Aqueduct

option is public-private partnership? Could provide piping to secure water supply

- With this large an energy generation potential many engineers have wondered why the city does not build a hydro system to recover the lost energy from the downhill run
- There have been attempts to build a facility with public funds in the past that did not get beyond the design stage. One option is to look at a public-private partnership that would sell electricity to CESPT at a much lower cost
- A solar park is being considered but has a higher capital cost
- There are also some piping changes that would be needed to handle the increased pressure and to account for the loss of energy when fresh water is dumped into reservoir lakes.
- The ideal situation is to reroute a part of the water stream around the existing dams so the water stays in the pipe and builds up pressure and if needed build an additional pipeline
- This is a logical step as one of the pipelines is now past its useful life at 43 years of age and could break anytime so added pipeline capacity for hydro would provide a part of that piping



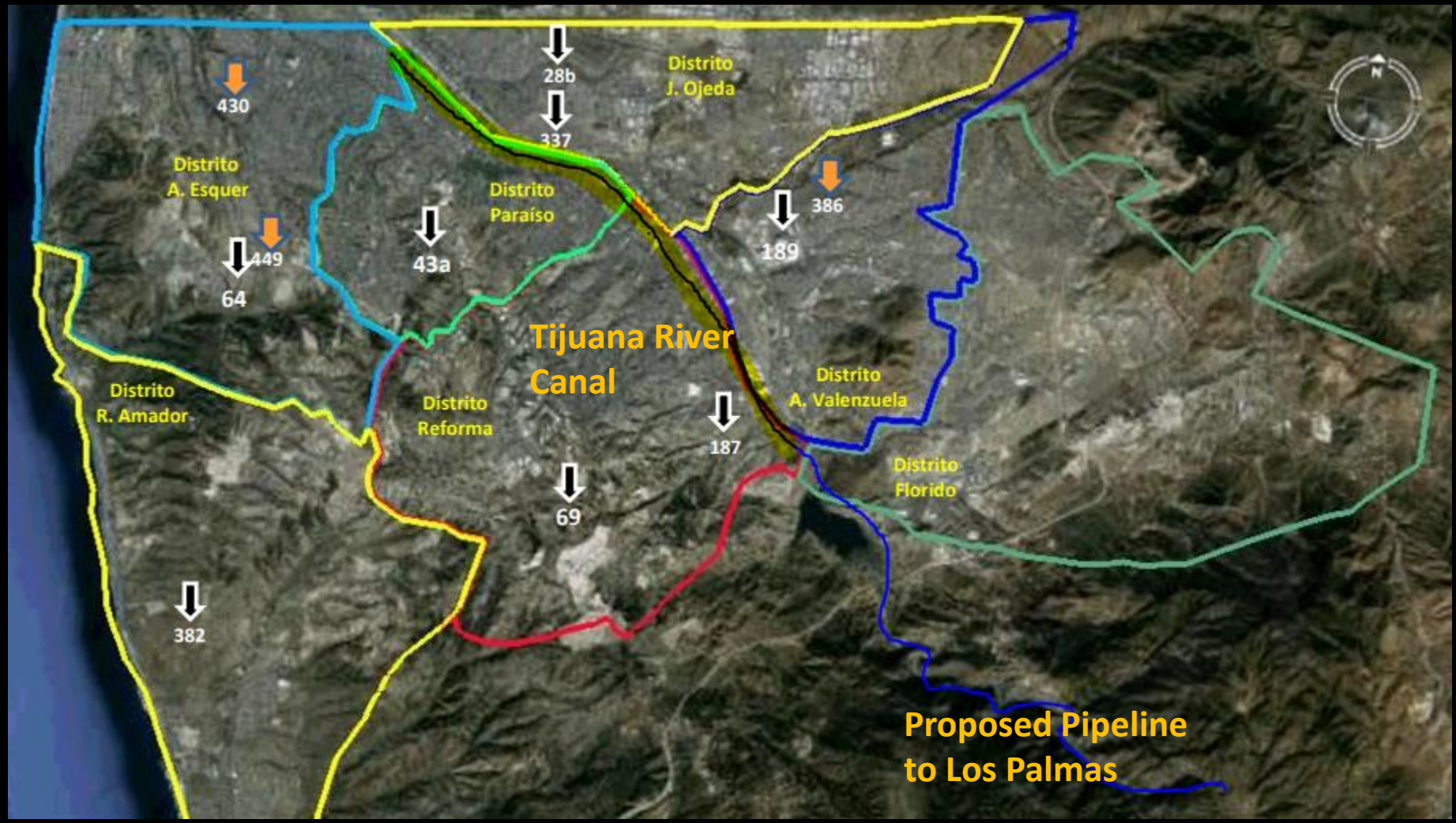
2 pipelines handling up to 3000 liters/sec. each
3 dams with reservoirs where pipeline is discharging
1050 meters of vertical drop, which is huge for hydro
5300 liters/sec water x 1050 vertical feet = lots of energy
Requires some new pipelines to handle high pressure
Requires piping around reservoirs to retain pressure
If designed right it should generate electricity equal to energy spent pumping fuel up the hill.
Tijuana will lower energy bill, produce renewable energy and reduce economic drain from high electric costs

Proposed Wastewater Plant Upgrades & Pipelines

Tijuana, Rosarito & Tecate

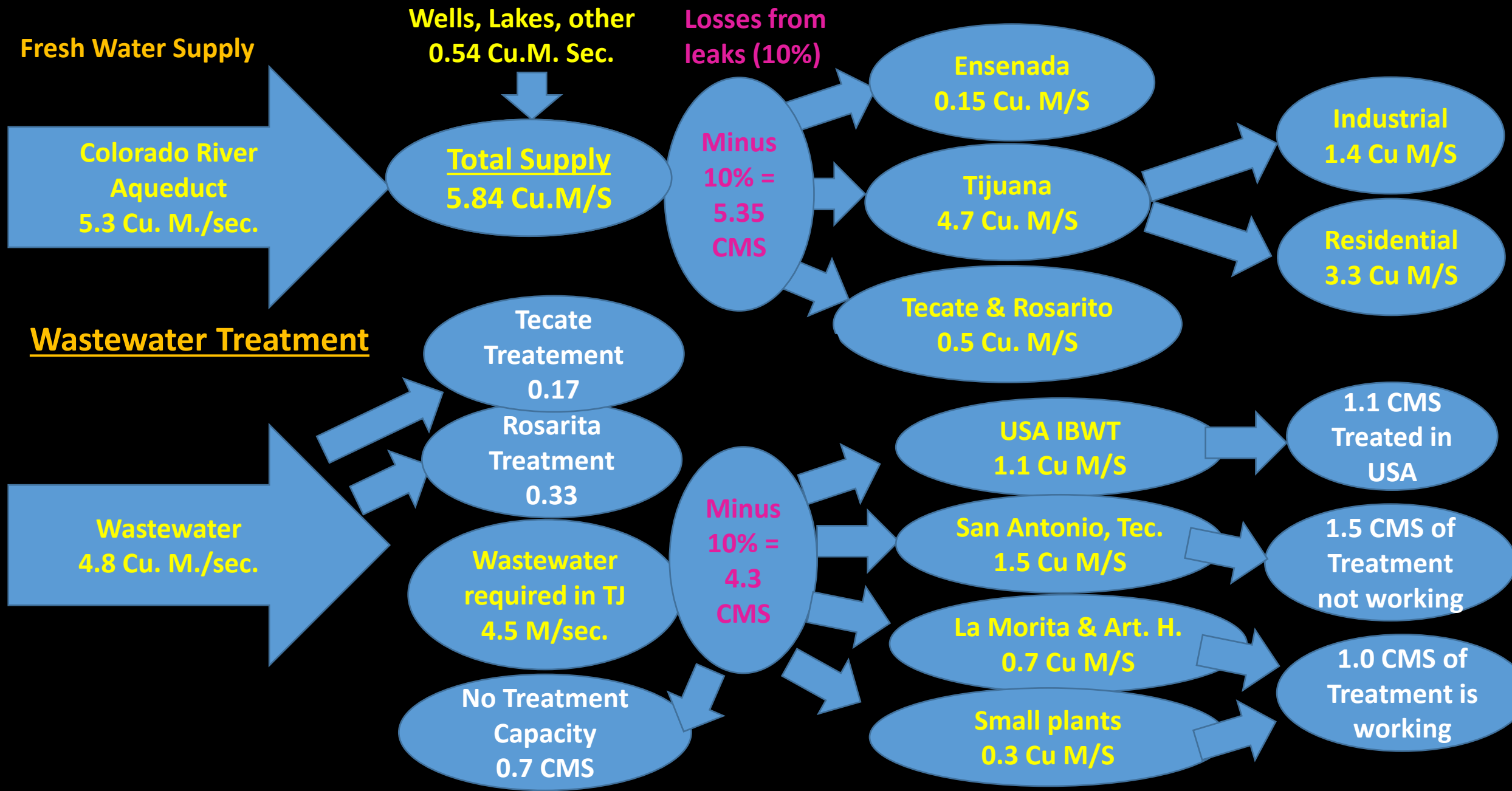
Tijuana & Rosarito Drainage Basins & Water Districts

CESPT Water District Organized based on Drainage Basins and most flow into Tijuana River Canal



Some drainage basins in Tijuana are divided by large hills especially the 2 Districts further west.
Most districts drain into the Tijuana River canal but Distrito A. Esquer and Distrito Amador flow into the Pacific Ocean

Current Water & Wastewater Flows in Tijuana Basin



Tijuana Treatment is at End of Basins & Then Also Uphill

Largest treatment plant is at the top of the hill in Punta Bandera

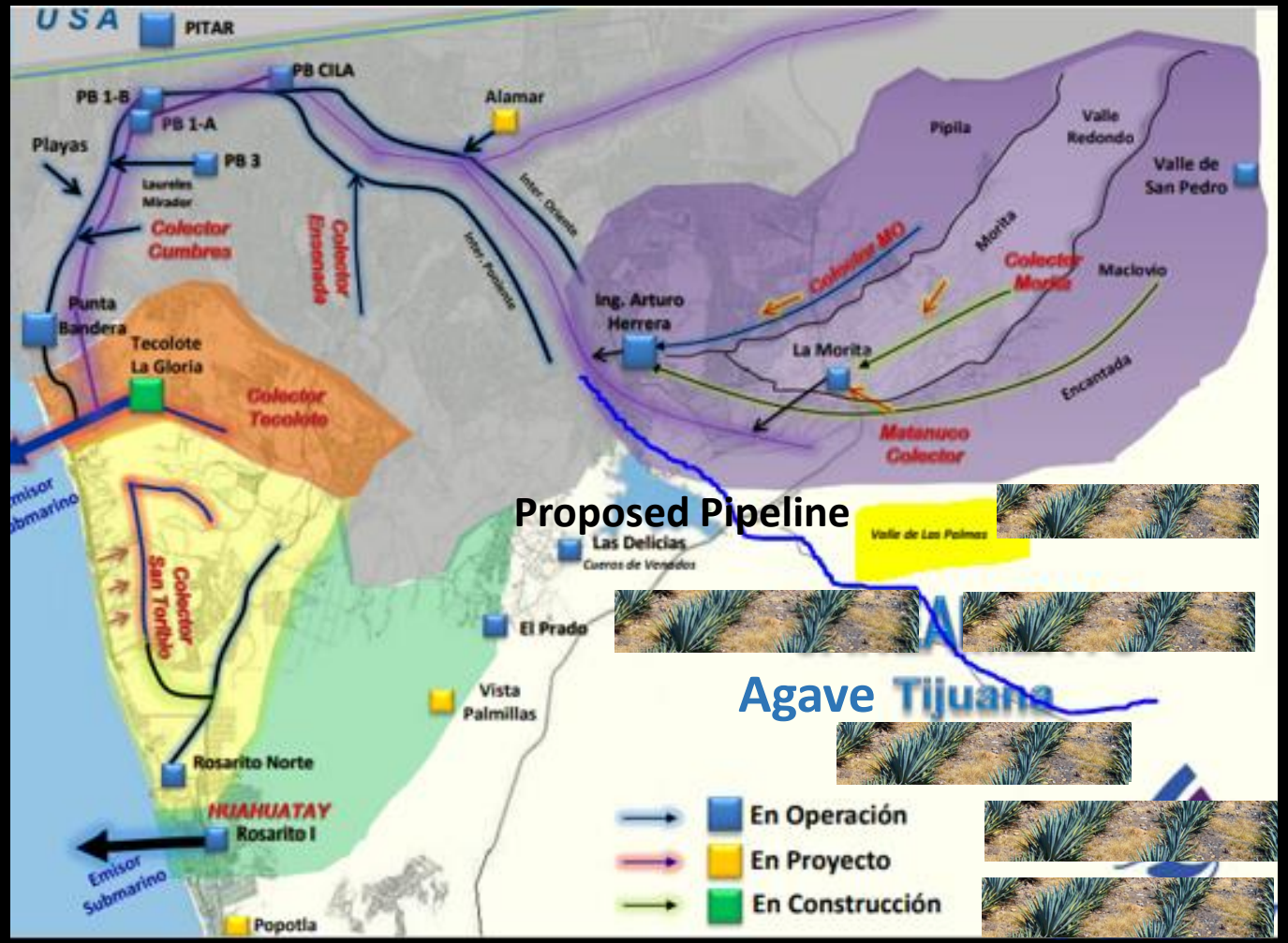
Drainage of wastewater flows down from Morita and Maclovio and Encantada to treatment at La Morita and Arturo Herreira, which are the best functioning Tijuana wastewater plants

This treated wastewater is then discharged to the Tijuana River Canal where it mixes with untreated wastewater and flows to the USA border where 1100 liters/sec. is treated at PITAR

Wastewater not going to USA is pumped up 800 meters with pump stations 1B, 1A and BP3 at great expense (2.9 pesos per liter) to Punto Bandera

Punta Bandera/San Antonio de Los Buenos is not operating well and there is no submarine pipe deep to the ocean. Tecolote La Gloria is still not completed and this drainage is untreated now

Rosarito and Rosarito 1 are separate drainages and have operating plants but discharge is to streams



San Antonio de Los Buenos, Largest Tijuana Treatment Plant

1100 lps of wastewater capacity, Largest plant in TJ is at 800 meters height

San Antonio de Los Buenos is the largest treatment plant in Tijuana. Operating cost is high because wastewater from downtown Tijuana must be pumped up 800 vertical meters to the plant. This is estimated to cost CESTP $2.9 pesos per liter or $9.6 million USD/year

The difficulty of counting on this treatment plant for a large portion of the treatment capacity is the high cost of operating the plant because of its high energy cost for pumping. In addition, it now discharges to the ocean via a stream and there is no submarine pipe.

We can improve performance of wastewater treatment by using electrolysis to undergo separation of human waste and water in a new equalization tank and then undergoing more refined treatment using flocculation, sedimentation, filtration & reverse osmosis. We would then sterilize with ozone

We would not suggest that it is worth putting anything more than minimal improvements into this plant as we do not think it is logical to spend $9.6 million a year pumping wastewater uphill. To pump water all the way to Las Palmas will be only 30% of this pumping cost and treatment capacity is much cheaper to build there. Savings from lower electric costs can cover the cost of better treatment facilities vs. major upgrades and a submarine pipe 10 km to sea.

San Antonio de Los Buenos is at 800 meters & not operating some of the time. It has high pumping costs estimated at US $9.6 million

We suggest only minimal upgrades to this plant and shifting wastewater now being pumped uphill to a new treatment plant in Las Palmas

Improvements to Arturo Herrera Wastewater Plant

Treatment Plant will be Improved by Using Ozone, Electrolysis, Floculation & Diverting effluent

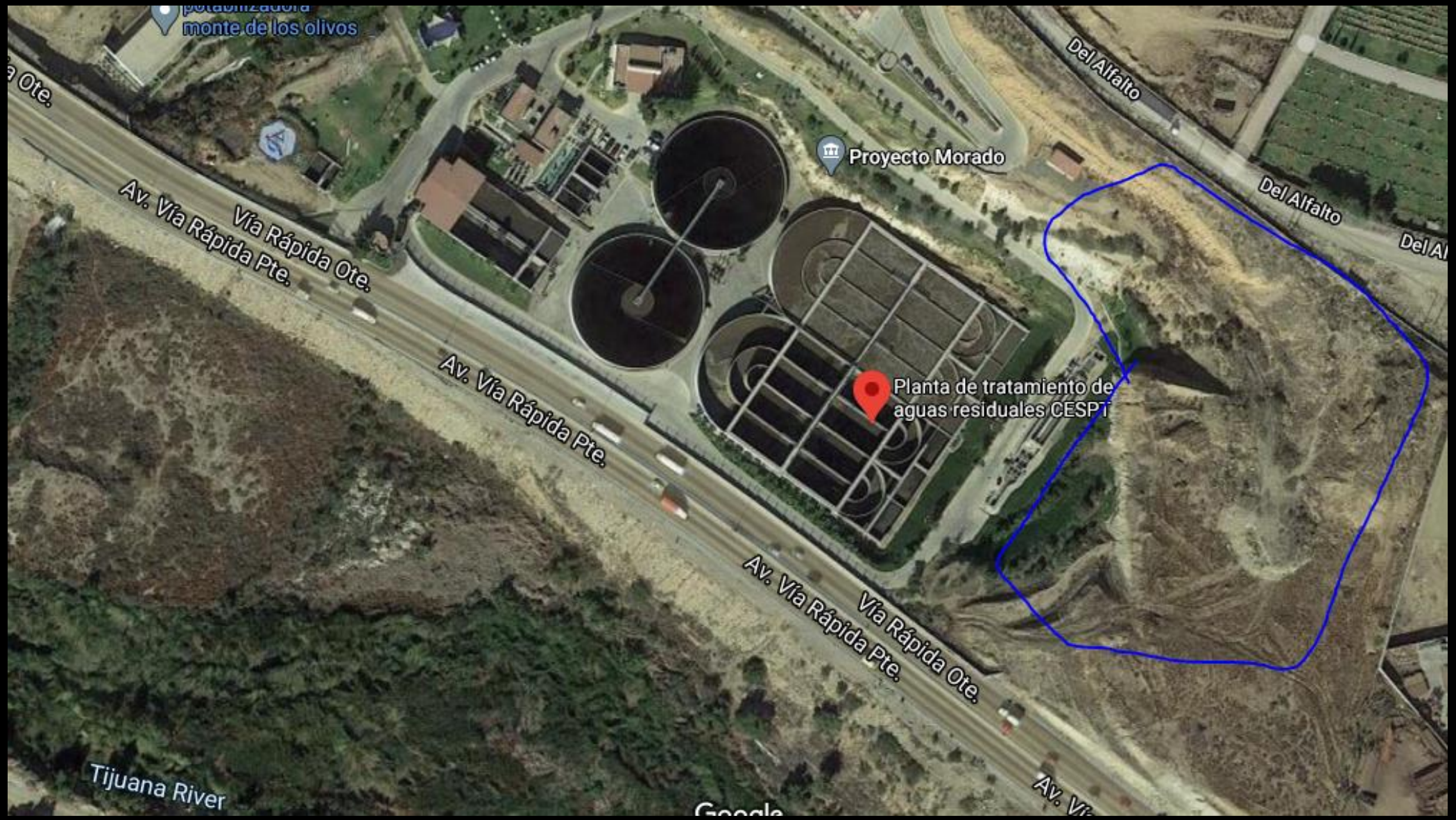
- An important municipal treatment plant in TJ is CESPT Arturo Herrera (Insurgentes) with 480 liters per day of capacity and major infrastructure to treat wastewater

- We will improve performance of wastewater treatment by using equalization tanks and electrolysis to undergo initial separation of human waste and water and then undergoing more refined treatment using flocculation, sedimentation, filtration & ozone for sterilization

- The improvements to this wastewater plant will allow it to operate without chlorine since we only need electricity for ozone with better sterilization than chlorine. This improves operational reliability.

- All of the discharge of treated water from this plant will be sent via a pipeline to SE desert areas just over the hill and down a canyon about 25 Km away to grow blue agave in an empty desert region and some water for use in vineyards now facing collapse due to salt intrusion

Arturo Herrera Treatment Plant & Potential Area for Expansion



Rebuild Tecolote La Gloria to Clean Water -Create Fish

Treatment Plant That Was Never Finished Could be Public Private Partnership to Create Food/Jobs

- 600 liters per second of wastewater is now going untreated into the Pacific from a canyon between Rosarito and Tijuana that is a major pollution source.
- We are proposing to complete the Tecolote La Gloria wastewater plant using a combination of ozone and electrolysis and existing tanks with water lilies and then production of filter feeding fish for recreational use
- The cooperative management this wastewater plant could allow it to operate at high levels of efficiency while demonstrating new techniques to enhance wastewater system design using ozone, electrolysis, biological treatment and other wastewater innovations
- The river that is now untreated sewage polluting the beaches of Tijuana and Rosarito will instead be producing clean water for food for the local population and creating a clean series of fish ponds in the canyon for recreation.

Proposal is to Pipe all Wastewater in Tijuana Riv. Canal

Keeping wastewater in pipes means treated water not mixed with untreated

PROBLEMS:

Most of Tijuana's wastewater starts in piping but when it reaches the Tijuana River Canal and is dumped into an open canal where it mixes with rainwater, treated wastewater, etc. Pumping of wastewater up to Punta Bandera and waste plant San Antonio de Los Buenos results in high pumping costs

Tecate treated wastewater flows down the Tecate River to the Tijuana river where treated and untreated wastewater mix in the Tijuana River so that wastewater enters again into wastewater plants in USA or Punta Bandera requiring double treatment.

High chemical spikes from illegal chemical dumping kill microbes which can shut down wastewater treatment plants

SOLUTIONS:

We are suggesting the need to keep wastewater separated in pipes based on whether it is treated or not through piping in the Tijuana River canal. Treated water will be pumped up the flat Tijuana River past the dam and into Las Palmas valley and will pick up treated water from Arturo Herrera and La Morita. Wastewater now being pumped up to Punta Bandera will instead be pumped to a new treatment plant in Las Palmas. Treated wastewater will be stored at a dam in Las Palmas. The results in less energy use, no waste discharge to sea, lower costs. Punta Bandera capacity can be used for nearby waste treatment instead

Benefits of Pipes on all Wastewater in Tijuana River Canal

Keeping wastewater in pipes means treated water is not mixed with untreated

EXISTING:

Tijuana River Canal with Mixed Waste Treated & Untreated, Residential & Ind.

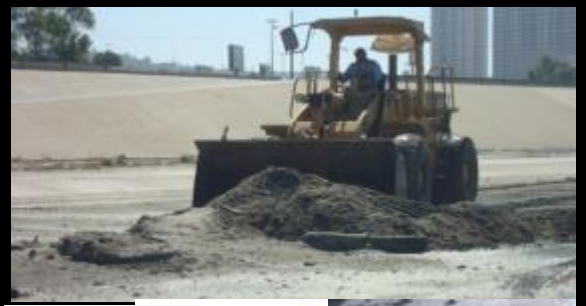
BENEFITS:

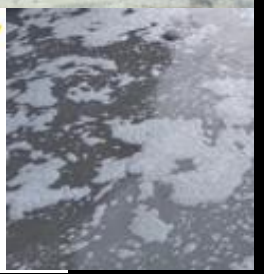
- Collecting pipes keep waste separate
- Return pipes to Las Palmas avoids having any discharge to USA beaches
- Avoids having Tecate treated water mixed with Tijuana untreated water

PROPOSED:

Tijuana River Canal with Waste All in Pipes, Separate Line Up Canal to Las Palmas Valley

PROBLEMS:





DIFFICULT TO MANAGE

- High maintenance from solid residues
- Mixing of rainwater and dilution by already treated water increase volume of waste to treat
- Insufficient wastewater capacity due to extra water and waste you are treating

HIGH POLLUTION LEVEL & EXPENSIVE

- High electric costs for pumping
- High carbon emissions from pumping
- High incidence levels of waste plant malfunction

EASIER TO MANAGE, LOWERS COST, SAVES $$

- Low maintenance cost & lower pumping costs
- US wastewater flow is controllable or eliminate
- No need to pump water up to San A nt. Los B.
- La Morita & Arturo Herrera treated waste goes straight to Las Palmas, saves pumping cost
- No wastewater pollution from Pacific & TJ river
- Lower costs due to less pumping costs, less treatment time and more efficient operation
- Lower Co2 emissions from less electric use

Summary of Wastewater Pipeline Project Tijuana

Pipeline Could Be Built from Pump Station in Downtown up Tijuana River and to interior desert

Project 1	24 Km of pipeline up the Tijuana River valley around dam and down to Las Palmas
Wastewater	most wastewater in Tijuana will be captured for use in agave or to rescue wine industry
Production	120 sq. Km –12,000 hectares = 63-252 million gallons of ethanol, fibers for composites
Area Planted	SE of Tijuana, Palm Valley to Heroes del Desierto & East to Agua Hechicera
Water Quality	Water will be treated to close to irrigation water standards and sterilized sludge will provide fertilization for agave plants. Waste water will be sterilized and odor removed
Secondary	30 Km miles of pipeline from Palm Valley reservoir to Guadalupe Valley
Wastewater	Terciary treatment will be set up to treat 15% of water to meet vineyard needs
Production	Vineyards will be able to continue making wine that is now at risk due to salinity issues
Water Quality	Water will be treated to irrigation standards and fully sterilized with ozone & UV so there is zero risk of disease transmission

Tecate Wastewater Challenges & Solutions

Tecate has similar problems to Tijuana involving industrial pollution & biological based treatment

Tecate has a set of problems similar to Tijuana in that there are a set of industrial parks and Maqueladoras that can sometimes discharge spikes of industrial chemicals into the waste stream that kill the microbes used to operate wastewater plants.

One solution is to initiate industrial chemical and water recycling at the industrial parks in Tecate combined with improvements to the municipal wastewater plant. This would be evaluated as a part of the study of industrial parks and treatment plants in Tijuana with Tecate industrial parks included and recycling tech demonstrated.

Once industrial pollution is eliminated from the waste stream it is much easier to develop a work plan for conversion of Tecate wastewater plant, with the aim to improve water quality discharge to irrigation standards.

A pipeline for moving irrigation water can be run directly from Tecate to Las Palmas as it is primarily downhill. The quantity of water of 218 liters/second (18.8 million liters per day) will need to be considered in looking at pipeline cost & water use versus other options and in considering value of water, where it will be used and other factors.

One option is to grow Agave just along the whole pipeline length including UABC Vale de Las Palmas. The feasibility study will evaluate land available to grow agave and distance from Tecate and develop a plan for utilization of wastewater in these locations.

Treated Wastewater Will Be Moved to Fields with Large Pipes

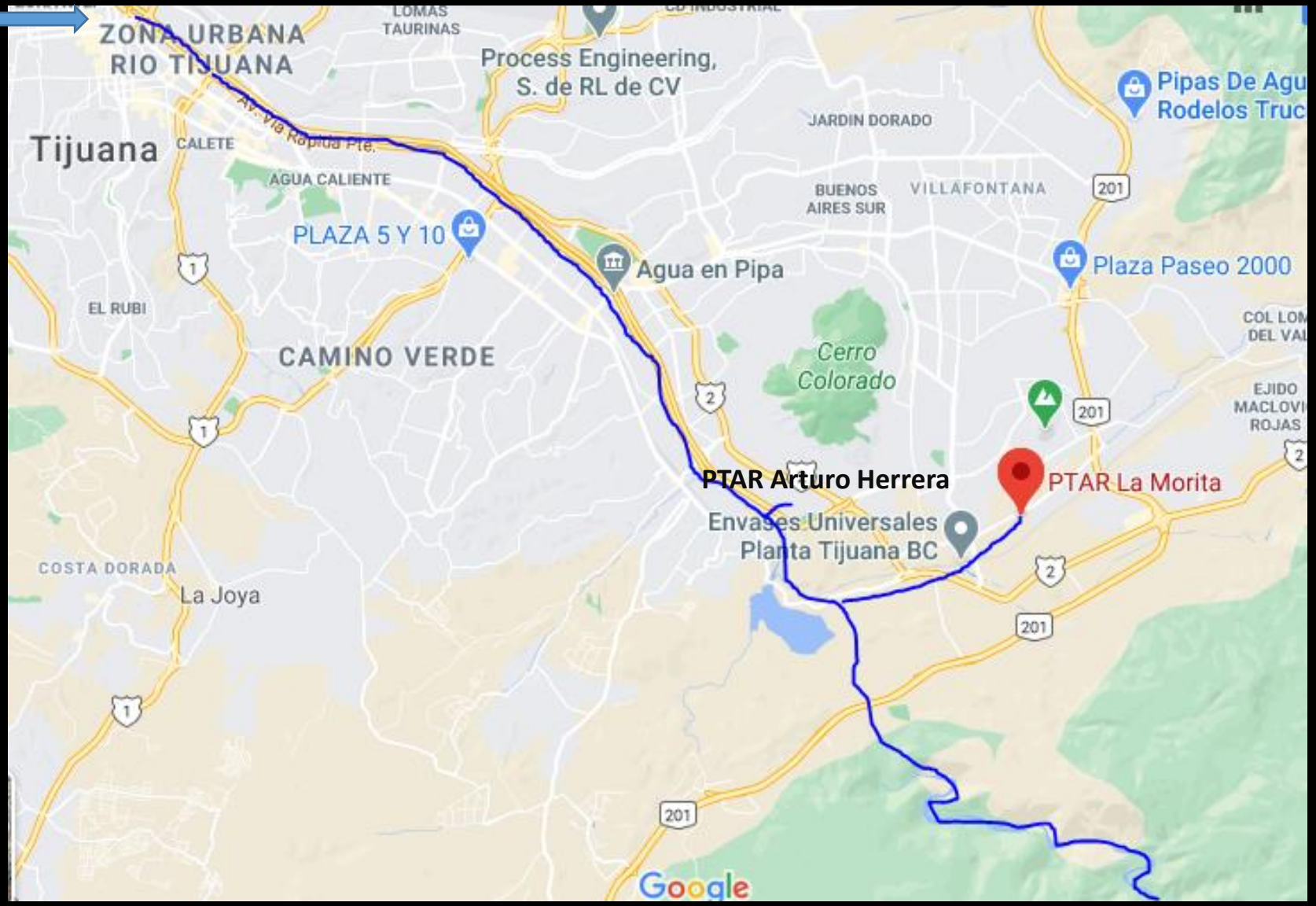
Special sealing systems eliminate leakage, piping will be built on site using injection equipment

- All of the wastewater from the Tijuana will be shipped to the desert from the treatment plants so that there are no wastewater discharges from treatment plants into the Tijuana River and no polluting of the beaches in the USA
- Some steel piping will be needed on downhill runs to account for pressure
- Energy generation will occur on downhill pipe runs to pay for pumping costs of electricity where needed

Proposed Pipeline Along Tijuana River & Connecting to Plants

We will connect waste lines to a pipeline so 100% of wastewater is captured in Tijuana River, treated in waste plants and sent 25 Km to the desert for biological treatment

Pumping Station



Potential Route for Pipeline up Tijuana River

Length of Pipeline to Las Palmas	17 miles (25 Km) to new treatment plant in Las Palmas
Additional piping to Guadalupe	about 17 miles or 25 Km additional piping to Guadalupe Valley
Expected Cost	$1 million USD per mile or $17 mil to treatment plant Las Palmas
Type of Pipeline	Polypropylene pipe
Size of Pipeline	to be determined in study
Capacity	up to 4 cubic meters per second

Proposed Wastewater Dam & Treatment Plant in Las Palmas

Dam will be built to store piped wastewater and water treated for agave/grapes

TREATMENT OF 2.4 CMS of WASTEWATER IN LOS PALMAS:

- Wastewater from Tijuana will be stored in reservoirs consisting of cement dams built using natural hills and existing craters
- We can develop various reservoirs that provide storage of wastewater prior to treatment and that store irrigation water prior to sending to the fields
- We can use the storage as a location for treatment by incorporating in the reservoir design a means to equalize and sterilize water to eliminate disease threat
- One of the treatment locations can provide the water being sold to wine growers in Guadalupe Valley where the water supply is in serious trouble because of salt incursion into aquifer. This water can meet tighter standards than agave water by going through secondary treatment to bring down suspended levels to international irrigation standards
- Cost of this treatment approach will be much lower than building 2.4 cu. meters/second of capacity in Tijuana.

WATER STORAGE & TREATMENT PLANT LOCATION of 2.4 CMS:

Treated Wastewater Sent to Assist Guadalupe Valley

Portion of treated wastewater sent to Guadalupe Valley for Solving Wine Crisis

HIGH LOCATION OF STORAGE FACILITATES DISTRIBUTION:

- The storage reservoirs are located a little higher than the valley for good reason
- The plan is to use the pressure from the downward run from Tijuana to provide the uphill pressure to eliminate the need for any pumping
- This will make it much easier to move any water in storage after treatment down a hill to a set of valleys leading to Guadalupe Valley
- Other water will be sent to agave planting areas which are also higher so very little uphill pumping will be required.

PIPELINE FROM LAS PALMAS TO GUADALUPE VALLEY:

- Pipeline will carry irrigation water from Las Palmas to Guadalupe Valley
- Capacity will be based on requirements for vineyards . We have estimated a requirement for 500 liters per second which is about double current use
- Pipeline can be paid for by entering into long term contracts to sell water
- Project will insure preservation of Guadalupe wine industry which is threatened by poor quality high salinity level water and salt in the soil
- We will also introduce technologies to eliminate salt in soil, clean up soil and allow for higher value organic wine production in the future

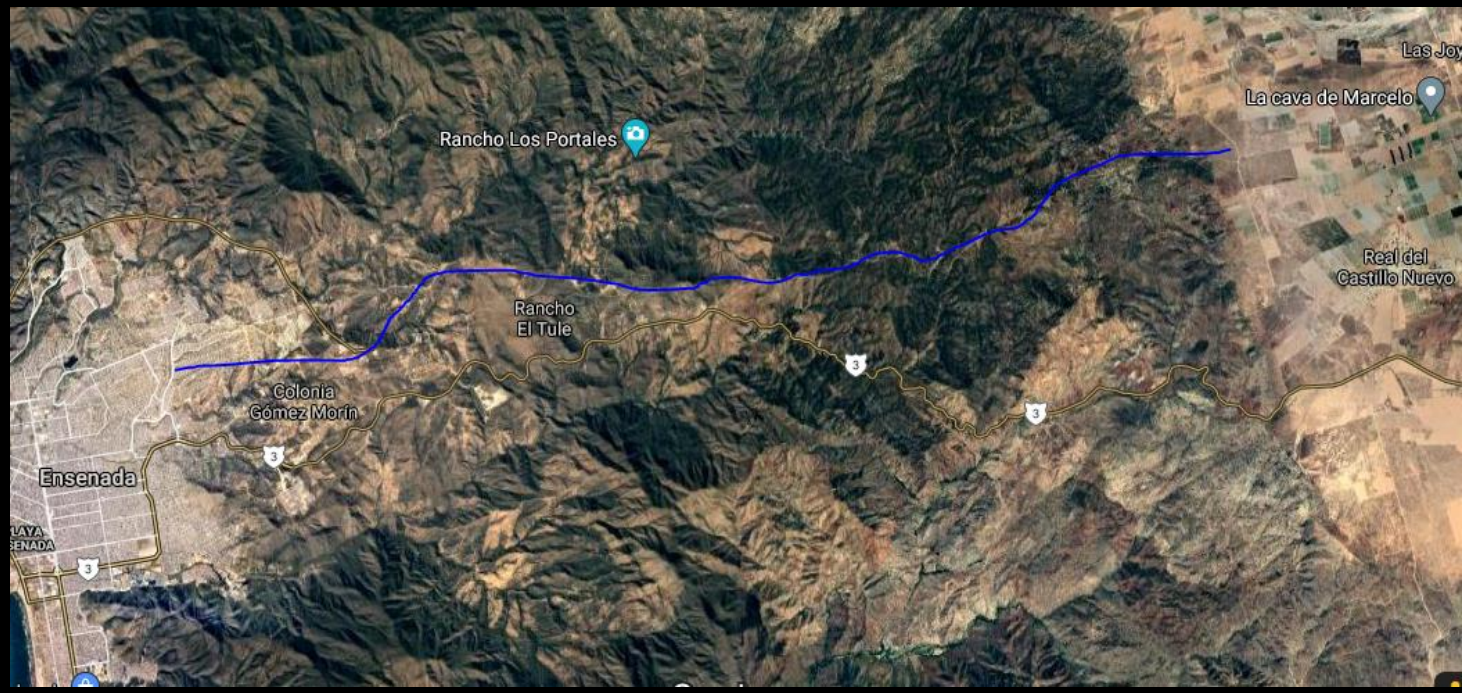
Pipeline From Las Palmas to Guadalupe Valley

Ensenada is Alternate Wastewater Source for Guadalupe Valley

Ensenada has much cleaner wastewater and is close to Guadalupe Valley

Ensenada has much cleaner wastewater because there are no industrial parks and only fish processing plants so it is much easier to operate wastewater plants.

Ensenada is close to Guadalupe Valley so a pipeline would only have to travel about 25 Km from the city to the valley. Efforts to build a pipeline were not successful in the past but no construction work was started so this was more of a financial problem. The benefit of the prior effort is that there is a clearly defined pipeline right of way and interest from City of Ensenada, State of Baja California Norte and the Federal Government to build the pipeline.



Pipeline route between Ensenda & Guadalupe Valley

We will consider the two options of Las Palmas pipeline extension or Ensanada pipeline in looking at solutions to the soil salinity problem in Guadalupe Valley. New pipeline technology and contracting systems may lower installed costs. One issue in pipeline operating costs is the higher because of some hills to climb. These factors will be considere and a cost benefit analysis completed of the two pipeline options for wastewater reuse

Why Reuse of Water is Key to Water Supply &. Growth

Solution = recycling ind. water, reducing leaks, recycling residential wastewater

EXISTING FOCUS IS ON NEW SUPPLY FOR WATER & WASTEWATER:

- Desalination plant in Rosarito under discussion with high CAPEX & OPEX
- Proposing various new treatment plants to solve waste problems
- Proposing additional aqueduct to move water from Colorado River

FOCUS SHOULD BE ON RECYCLING WATER and REUSING WASTEWATER:

- Recycling chemicals and water to industrial parks = 1600 -2000 liters/sec water
- Cost of this recycling program will be much less than new supply options
- Eliminating chemicals from wastewater stream then allows wastewater to be re-utilized in agriculture or for food or non-food energy production
- Without chemical and water recycling industrial parks will continue to dump high chemical load wastewater into sewers and wastewater plants will continue to dump untreated sewage because of breakdowns of these plants
- It takes at leas t 8 days for a wastewater plant to recover from chemical spikes

Ensanada Desalination Plant

Capital Cost: $57 million
Operating Cost: high
Co2 emissions: high
Capacity 250 liters/sec.
5.7 million gal./day

HIGH COST
HIGH CO2

Water & Chemical Recycling

Capital Cost: $50 million
Operating Cost: low
Co2 emissions: low
Capacity 1600 liters/sec.
36 million gal./day

LOW COST
6X MORE
WATER

1. IT IS IMPOSSIBLE TO CONSIDER WATER FOR REUSE FOR AGRICULTURE IF IT IS CONTAMINATED WITH CHEMIC ALS
2. IT IS IMPOSSIBLE TO OPERATE WASTEWATER PLANTS THAT HAVE BIOLOGICAL TREATMENT IF CHEMICAL WASTE IS DUMPED
3. THE ONLY WAY TO STOP ILLEGAL DUMPING IS TO MAKE IT ECONOMICALLY VALUABLE BY RECYCLING CHEMICALS TO INDUSTRY
4. TO AVOID RAW SEWAGE IN THE TIJUANA RIVER AND PACIFIC OCEAN, IT IS ESSENTIAL TO IMPLEMENT CHEMICAL RECYCLING
5. CHEMICAL & WATER RECYCLING CAN PROVIDE SIX TIMES MORE WATER FOR THE SAME COST AS A DESALINATION PLANT

Reversing Flow of Pumps So Water Goes to Desert Saves Money

High electric costs & Co2 emissions avoided that save millions in OPEX, CAPEX

LOWER OPERATING COST MEANS MORE WASTEWATER TREATED AT SAME COST

- 2.9 pesos per CMS to pump wastewater to San Antonio costs $9.6 mil. USD
- We can pump all the way to Las Palmas same wastewater and save half of costs
- Will move all 3.4 cubic meters instead of 1.7 cubic meters now moved at same cost
- This will allow Tijuana to treat all of its wastewater instead of counting on USA

LOWER CAPITAL COST BY BUILDING WASTEWATER TREATMENT IN LAS PALMAS

- 3.4 cubic meters sent to desert , 1 cubic meter treated, 2.4 CMS new treatment
- System design is based on assumption that industrial treatment will occur at separate waste recycling plant and almost all chemicals kept out of treatment
- We will upgrade plants like La Morita to treat industrial separately
- We will improve Arturo Herrera and send treated water in same pipe
- We will use Las Palmas storage l for treatment by using natural grading for cascading ponds that will use biological system of water lilies to eliminate dissolved solids – dual benefit of wastewater storage and treatment using plants
- System design includes equalization tanks in front end and different treatments as sewage moves through biological system
- Ozone will sterilize wastewater at end of process so there are no viruses, bacteria
- Semi-treated water will be moved out to agave fields partly through processing when water no longer smells and after sterilizing
- Fully treated water meeting irrigation standards will be sent to Guadalupe Valley

Upgrade will Double Capacity

Old Capacity: 2 CMS
New Capacity: 2.4 CMS
Co2 emissions: low
Energy Cost low

LOW ELEC.
LOW CO2

Allmost All Wastewater Reused

Capital Cost Indu.: $60 million
Capital Cost Res.: $60 mil
Piping/dam cost: $60 mil
Operating Cost: low
Reuse Rate > 80%
New Capacity: 2.4 CMS
293 million gal./day used for agriculture

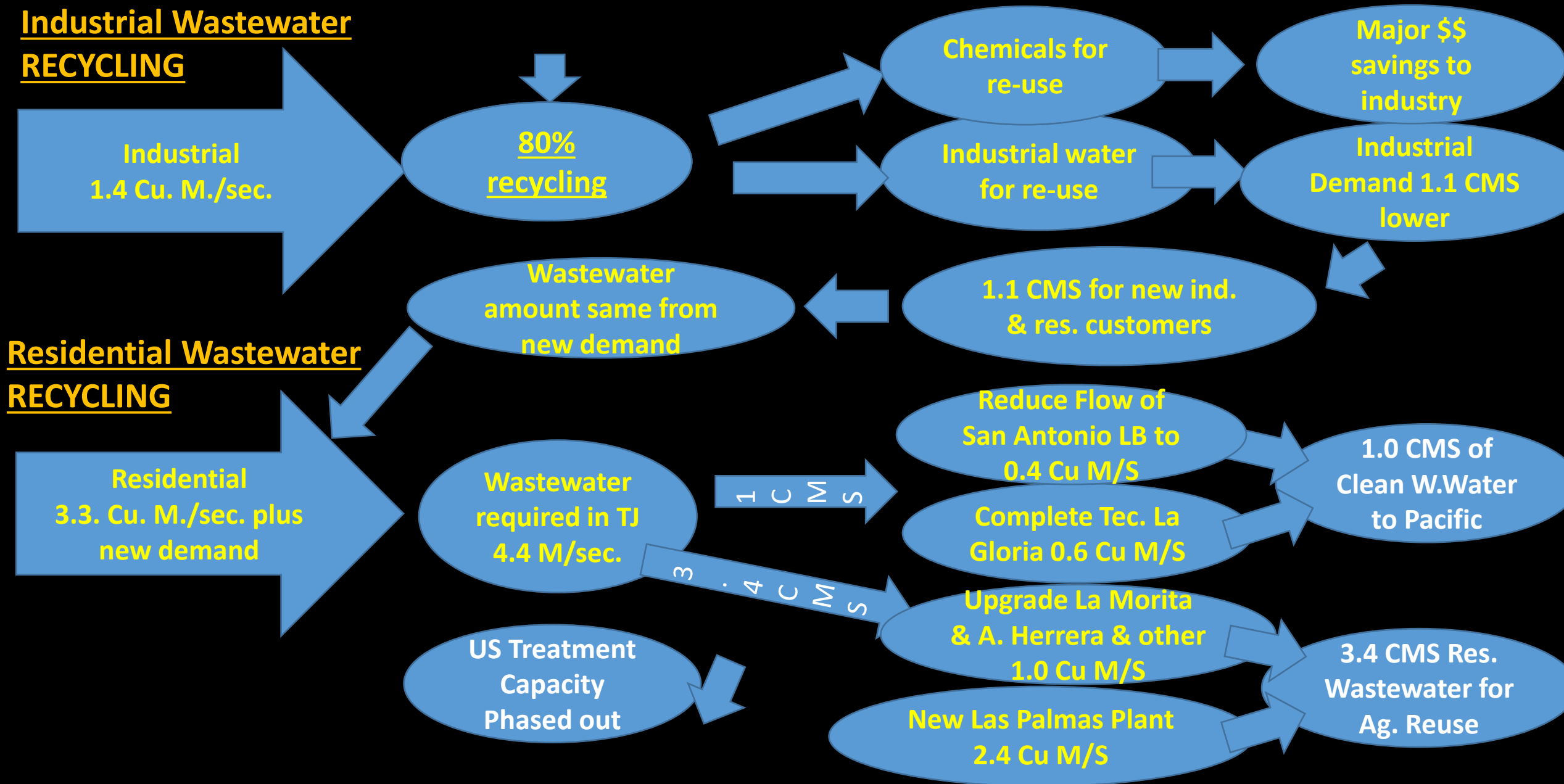
LOW COST
80% Waste
Water
REUSED

Large
Volume of
Water for Ag.

=

JOBS

NEW Wastewater Flows with Go3 Carbon Plan



Cost Effectiveness of GO3 Carbon vs. Other Options

Solution = recycling ind. water, reducing leaks, recycling residential wastewater Is much lower in cost, lower risks and greater benefits than other options

Treatment Options	Working Capacity	Industrial Waste Recycling & Cost	Residential Recycle & Cost	Piping Required	Risks and Benefits
Current CESTPE (TJ)	1 CMS now works 1.1 sent to USA	none	none	Repairs needed	Most waste not treated Health risk
GO3 Carbon CalMexar Tijuana Plan Mexicali plan	6.7 CMS (1.4 ind., 3.3 residential, TJ), (2 CMS Mexicali) None sent to USA	80% waste water recycled $60 million cost TJ $30 million Mexicali	3.4 CMS reused for agriculture in TJ 1.5 CMS Mexicali $90 million cost	25 Km to treat plant Las Palmas 15 km Guadalupe $60 mil cost	100% waste treated, Low Risk, Big ag. benefit
Expand IWBC plant (TJ river only)	3.0 CMS, all Tijuana River water treated	No recycling $400 million cost	No recycling	Add to Submarine pipeline another 5 miles $40 mil.	60% treated High Risk, no ag benefit
Other recycling (TJ only)	2.0 CMS	No recycling undetermined cost	2.0 CFS for agriculture undetermined cost	High cost due to long distance (70 km) costly right of way (maybe $50 million)	40% treated, limited recycle limited ag benefit High risk

Wastewater to Agave Development Plan

Tijuana Basin Wastewater to Las Palmas & Guadalupe
Mexicali Wastewater to Deserts E, W & South
Imperial Valley Irrigation & Wastewater for Agave

3 Project Sites to Use Waste & Irr. water for Agave, Potato

MEXICO

1) **Tijuana-Las Palmas & Guadalupe Valley**
3400 LPS wastewater
2900 LPS for agave
500 LPS for grapes-other
12,000 ha. agave
Low yield – 63 mil gal./yr
High yield – 252 mi, gal/yr

2) **Mexicali Valley**
1888 LPS wastewater
1888 LPS for agave/potato
7,552 ha. agave
Low yield – 40 mil gal./yr
High yield – 150 mi, gal/yr

USA

3) **Imperial Valley**
249,000 acre feet irri. water
Future growth- wastewater
10,000 acres agave
Low yield – 21 mil gal./yr
High yield – 73 mi, gal/yr

TOTAL

Wastewater & Water Use
4,788 lit./sec. wastewater
+ 249,000 acre feet water

Agave Growing Area
25,552 ha. of Agave

Agave Ethanol Production
Low yield 125 mil. gal/yr.
High yield 463 mil. gal/yr.

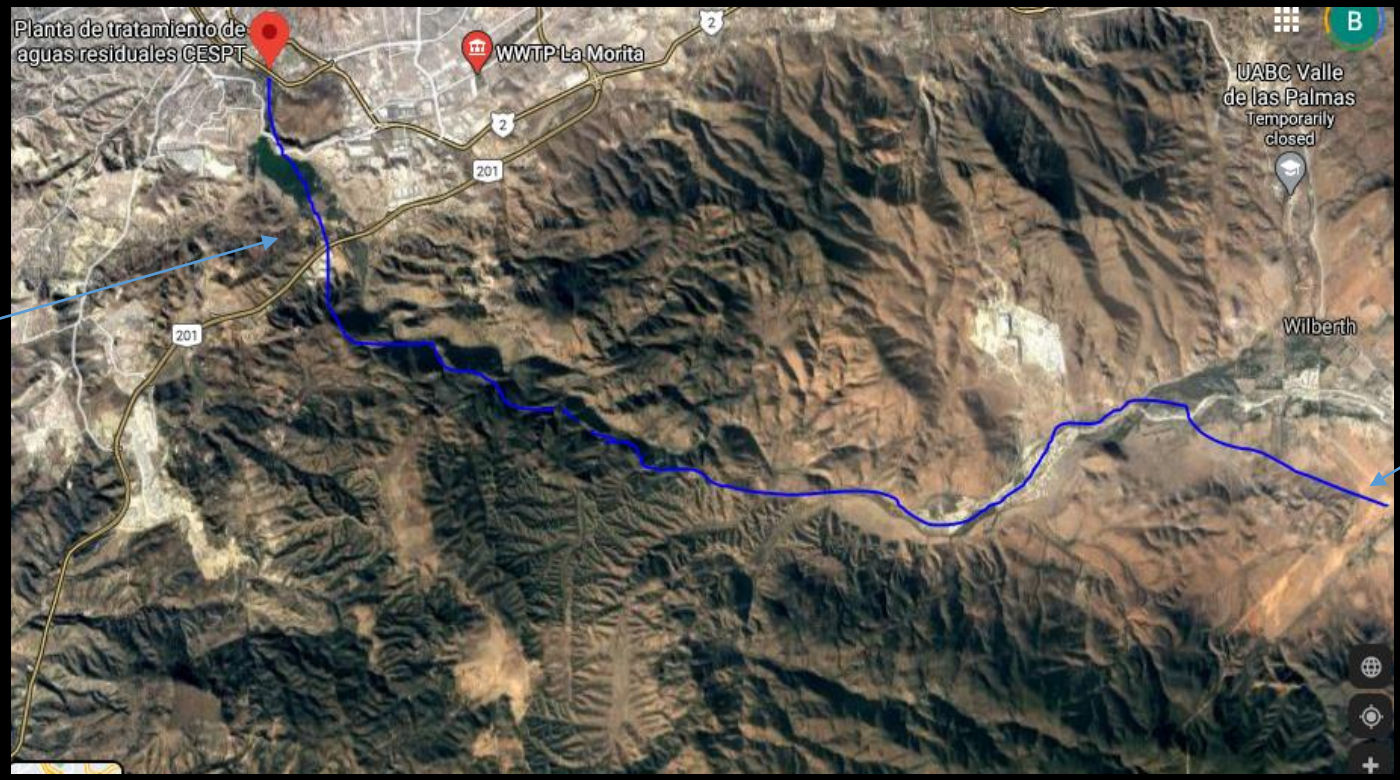
Waste Water Available & Crop Production E. of Tijuana

Diversion- Irrigation Line from Wastewater Plants in Tijuana:

Type of Piping:	Polypropylene, built with machinery on site
Size of Piping:	48 to 70-inch diameter line at start, reduced diameter as flow diverted to irrigation
Distance of line:	17 miles to dam & treatment plant, up to 140 Km of land being irrigated for agave, grapes, etc.
Percent of Diversion:	80% of Tijuana sewage plant output diverted to irrigation except canyons of West Coast of TJ
Location of line:	Along existing Tijuana River concrete culvert around dam and reservoir through notch to L.P.
Gross/Net Volume:	up to 3400 liters per second,293 million liters per day, 77.6 million gal./day
Storage at End of Line:	several reservoirs of 865 cubic meters built at end of line for storage & for biological treatment
Agave Irrigation Area:	80 square miles (120 square kilometers), 12,000 hectares, mostly East of Las Palmas
Type of crop planted:	Blue Agave, special hybrid variety
Minimum water needs:	600 mm per year
Volume Available:	1 liter per second of irrigation water equivalent to 8.6 mm of rainfall per day
	1 liter/sec = 8.6 mm/day * 365 = 3,139 mm per year
	To achieve 600 mm per hectare net after evaporation losses will require 0.25 liters/sec.
Area Can Irrigate:	2900 liters per second will allow for irrigation of 12,000 hectares or 2400 ha./year harvested
	500 liters/second available for sale of irrigation water to vineyards & other users

Proposed Route for Pipeline to Las Palmas

Wastewater Pipeline



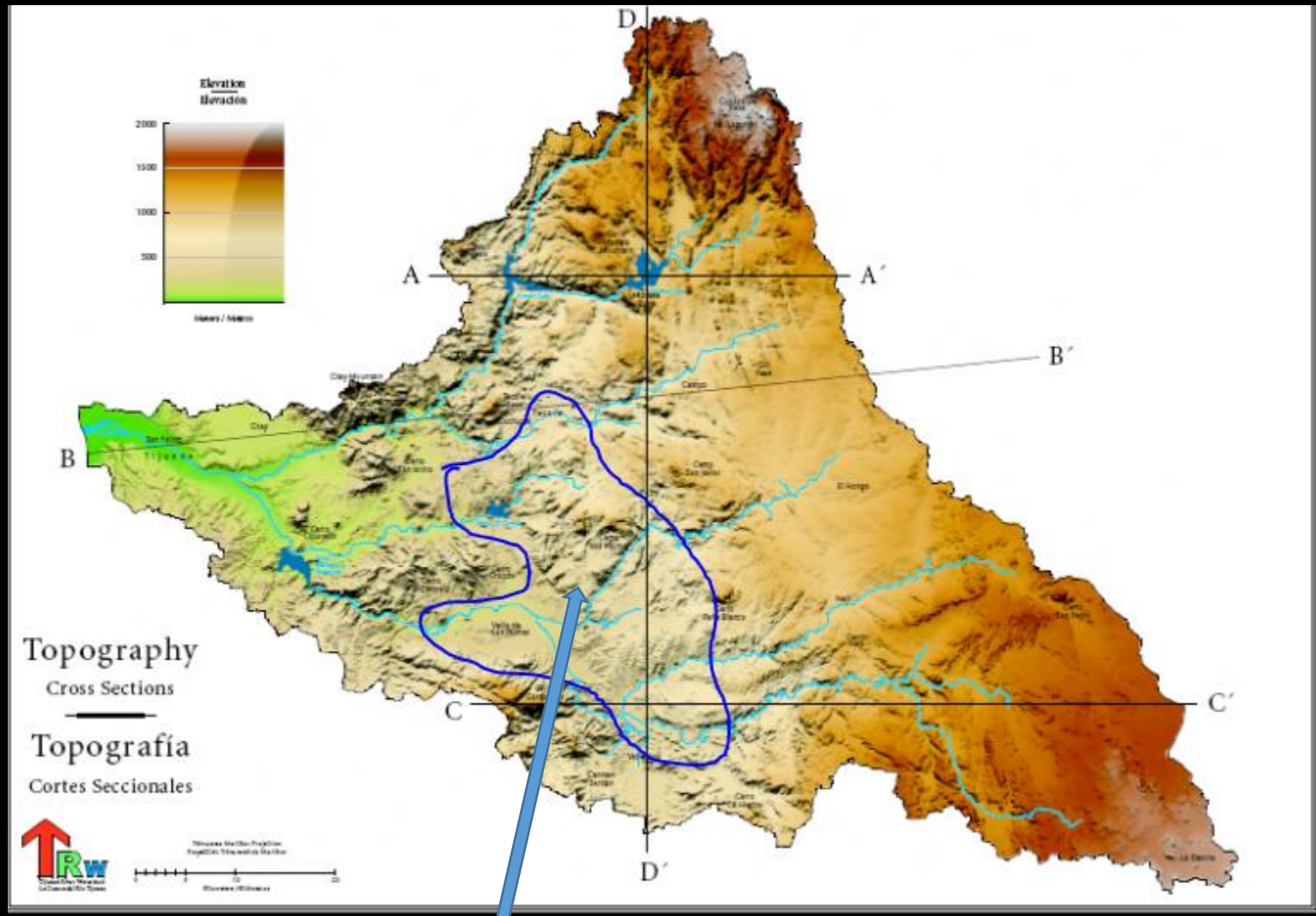
Storage Reservoir

Length of Initial Pipeline	15 miles (25 Km) to start of treatment plant & reservoir, irrigation areas
Length of pipe in irrigation area	100 miles of area irrigated east of Tijuana and South to Guadalupe Valley
Expected Cost	$1 million USD per mile or $15 million plus storage cost, farm irrigation cost
Type of Pipeline	Polypropylene pipe 48 to 70 inch pipeline , capacity 4 cubic meters /sec.
Type of Storage	Cement dams using canyon walls for side walls, at end of pipeline above

Topography Map Shows Growing Area in Tijuana for Agave

Ideal Growing Area is Lower Elevation/ Non Urban

- Estimated wastewater available suggests it would be possible to grow about 14,000 hectares of agave in Tijuana Basin
- Logical focus of planting would be in dry desert areas that have little agricultural activity but are low enough elevation (500-1000 ft.) to avoid freezing in the winter
- Focus area for planting agave has been Las Palmas Valley and areas east, north and south because of ideal combination of low land values, low elevation and proximity to wastewater in Tijuana
- End result will be greening of a large area of desert that now remains largely devoid of either agriculture or wild desert plants because of the lack of water



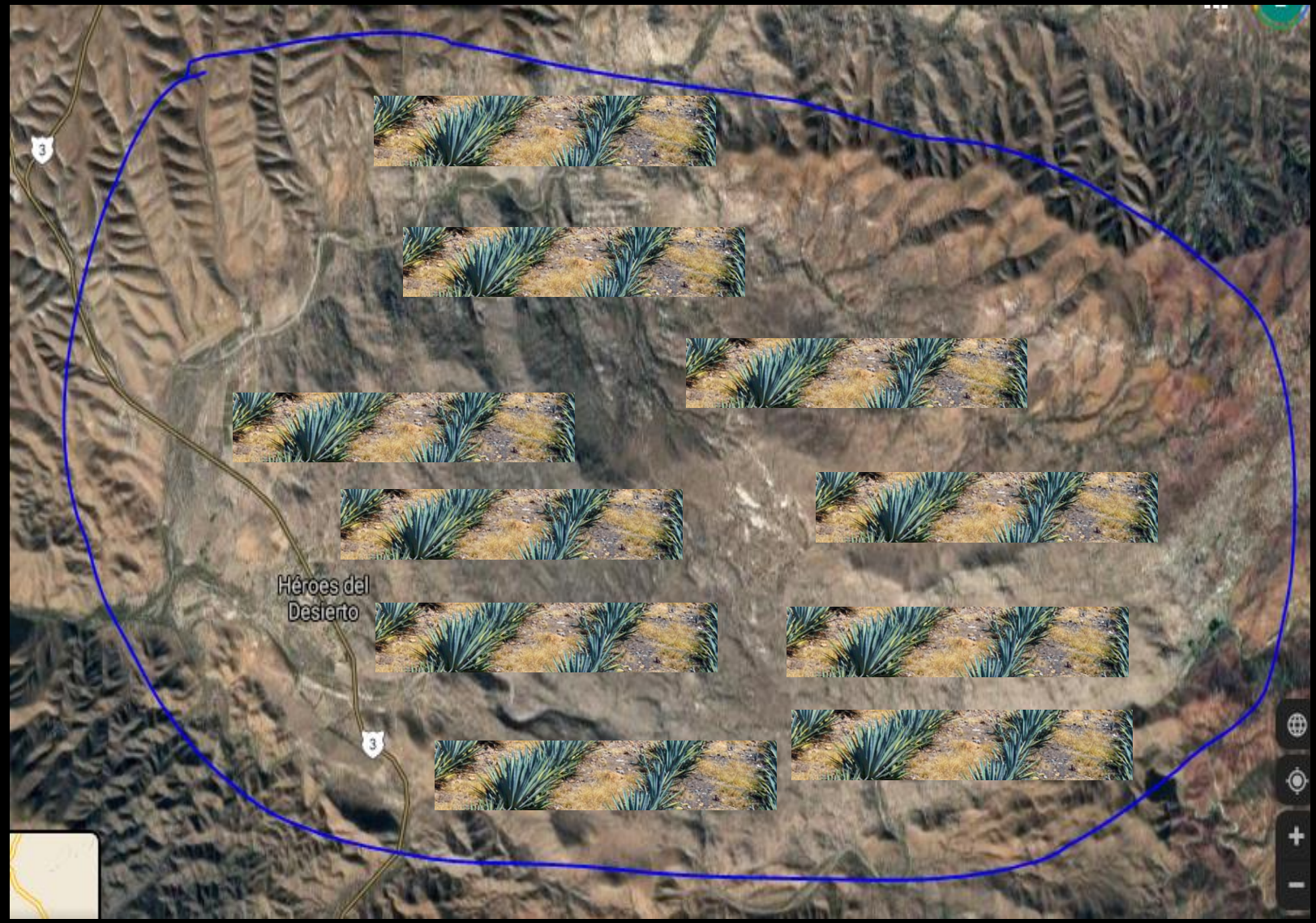
Part of Targeted Growing Area for Agave (additional land further south)

Planting Area Near Las Palmas for Agave

SE of Tijuana, Las Palmas del Valle

Planting Area Heroes de Deserto for Agave

SE of Palm Valley



Mexicali Water & Wastewater

Description of Main Wastewater Plants
Possible Growing Areas for Agave
Opportunities for Chemical Recycling

Two Main Treatment Plants in Mexicali for Wastewater

Waste Plants will be Improved by Using Ozone, Electrolysis & Diverting effluent to grow Agave

Zaragoza Treatment Plant

Las Arenitas Treatment Plant

- There are two main wastewater treatment plants in Mexicali, Zaragoza and Las Arenitas. Combined capacity is 2140 liters per second.
- Can improve treatment efficiency with ozone and electrolysis which increases capacity and divert water after treatment to grow agave

Wastewater Treatment			
Coverage	100% of collected wastewater		
Treatment facilities	**Plant**	**Type**	**Capacity**
	Zaragoza	Oxidation ponds	1,300 lps (29.7 mgd)
	Las Arenitas	Oxidation ponds	840 lps (19.2 mgd)
	UABC	Activated sludge	10 lps (0.22 mgd)
	CETYS	Activated sludge	7 lps (0.16 mgd)
	Tecnológico	Activated sludge	7 lps (0.16 mgd)

Source: CESPM, December 2019.
lps = liters per second; mgd = millions of gallons a day

Zaragoza Mexicali Wastewater Plant

Uses biological treatment that could improve with Industrial water recycling & agave planting

Zaragoza Wastewater Plant uses biological processes to improve wastewater treatment. However, it is now beyond its design capacity and often breaks down due to maintenance and supply issues. The main problem is chemical loads from industrial plants that kill microbes undergoing bio-treatment. Result is that discharge to New River is only semi-treated, not sterilized.,smells and is full of chemical toxins

We are proposing industrial water and chemical recycling to avoid contamination of biological processes. We will then route all piping exiting the Zaragoza treatment plant so that it goes to agave growing areas not far away (see map next slide)

100% of the wastewater (1300 liters/sec.) has not been allocated. The opportunity is to avoid contaminating the New River with this wastewater and instead grow 5200 ha. of agave which will provide a wild native plant while providing harvests of 1.05 - 3.5 million MT agave harvest/year, 210K to 700K MT of sugar and 110,000 to 350 K MT of ethanol (about 35 million to 110 million gallons/year. This will enhance biological treatment and greatly increase economic & carbon benefits

Los Arenitas Mexicali Wastewater Plant

Provides a good example of using biological treatment that could improve with agave planting

Lost Arenitas Wastewater Plant is an example of how to use biological processes to improve wastewater treatment. The plant quickly exceeded its design capacity after it was built and now uses biological treatment with ponds and a wetland for further treatment/social & environmental benefits However, system is prone to failure due to industrial chemical pollution which we will solve with industrial water and chemical recycling

30% (8000 acre feet or 3.6 billion gallons, 252 liters/second) is to be used for replenishing the wetlands and provide water flow for the Hardy River and Colorado Estuary. This supports bird life & ecotourism

70% of the wastewater (18,667 acre feet, 8.4 billion gallons, 588 liters/sec.) has not been allocated. The opportunity is to use the balance of the residual water to grow 2350 ha. of agave which will provide a wild native plant surrounding a wetland and enhance recreational value of site while providing future feedstock to produce annual harvest 470K to 1.65 million MT of agave and 94K to 310K MT agave sugar and 47,000-165,000 MT of ethanol (15 to 50 million gallons/year). This will provide additional biological treatment options and increase economic & carbon benefits

Proposed Zaragoza Waste Pipeline to Agave Growing Areas

We will move wastewater after primary treatment to grow agave in desert and produce zero emission ethanol

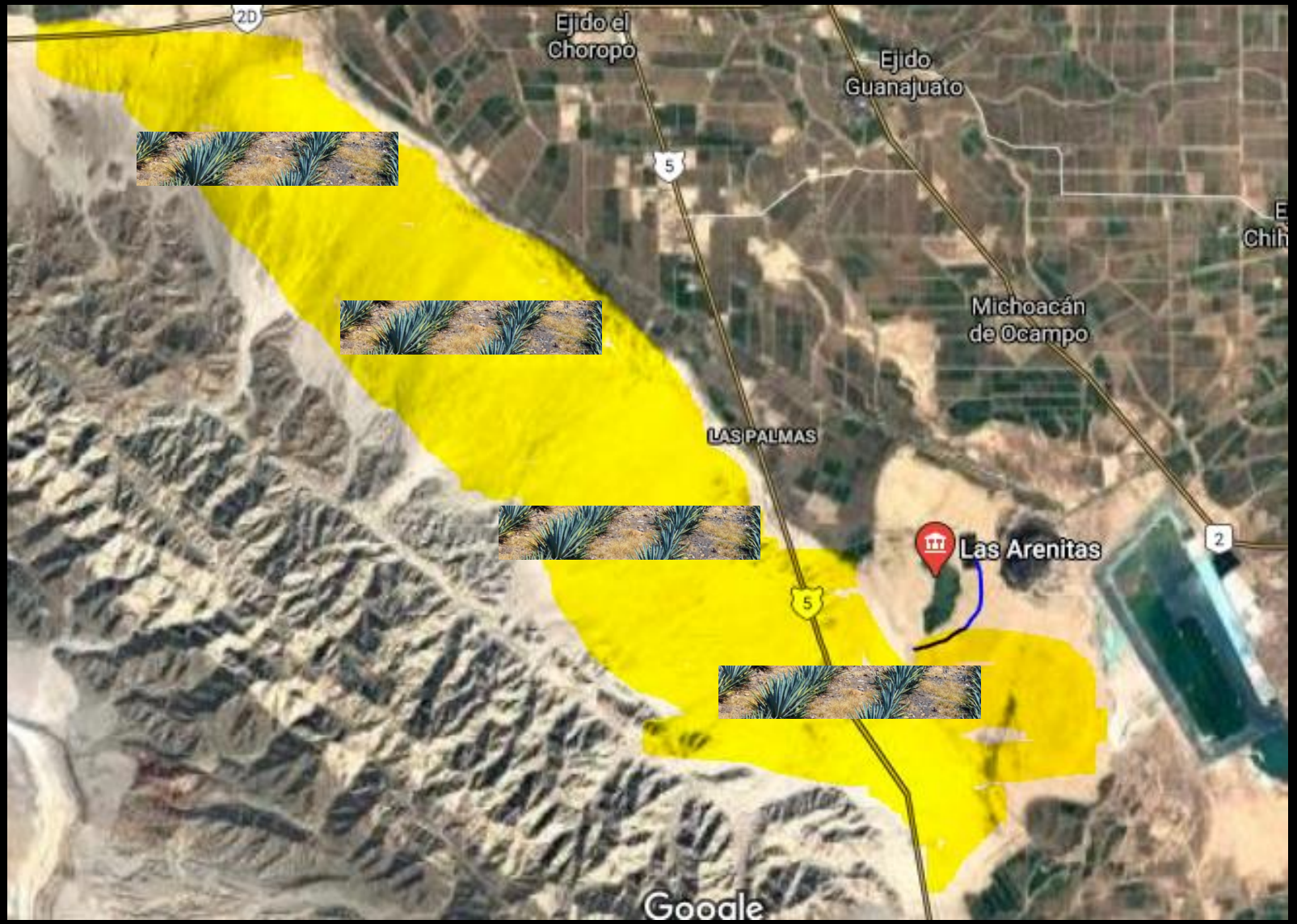
Additional Zaragoza Waste Pipeline Alternative for Agave

We can also move wastewater North and East to a desert area on the border

Proposed Agave Growing Areas Near Las Arenitas

Wastewater not allocated to wetlands and river flow will be used to grow agave in same area

Estimated Volume is 240 million gallons with potential market value of $720 million USD



Potential Benefit of Project for NADB Mexicali Pipeline Project

Project will help NADB meet goal of no discharge of wastewater to New River, solve chemical issue

- North American Development Bank (NADB) has $3.4 million USD in grant funds from the US EPA that is being matched by another $3.3 million in Mexican state and federal funds that will be used to replace aging pipeline distribution systems

- GCarbon CalMexar is suggesting that in the Industrial Subdivision piping could be re-routed to a new facility for recycling of wastewater and return of industrial chemicals to the industrial plants. This could be done by deferring industrial pipe replacement until the last phase of the project and support a study that details the feasibility and cost of this facility and its impact on improving the operation of the two main treatment plants with biological systems.

- The NADB project includes the replacement of 1257 linear meters of 8 to 15 inch PVC pipe along with rehabilitation of manhole covers. We would suggest establishing a dedicated set of industrial pipes that treat wastewater separately and then use all recycled water for agave production by piping treated water to the desert and truck chemicals for reuse back to the plants. By having dedicated lines for industrial wastewater that go to an industrial treatment plant, problems with contamination of biological systems will be avoided so there is less breakdowns of the municipal waste treatment plants. Monitors can also be installed to confirm the plants are complying with wastewater standards and to identify the chemicals coming to the plant prior to their arrival. Manhole covers can be sealed and locked so it is very difficult to remove without electronic lock decoding by the Water District.

- By eliminating chemical pollution from the wastewater stream it will then be possible to utilize sludge from post treatment processes as an organic fertilizer for low carbon impact non-food agave ethanol production.

Planting of Sweet Potatoes in Initial Years to Produce Ethanol

Agave has high yield but takes 5 years to grow, high yield sweet potatoes offer a year 1-4 option

- Agave has very high yield but takes a long time to mature (5 years) so any ethanol plant could not be justified until year 4. The alternative is to grow sweet potatoes in year 1-4 before all areas are cultivated in agave.

- To assess the feasibility of sweet potatoes we will work with the Ministry of Agriculture and local agricultural extension office. Sweet potatoes require good soil and more water but have yields similar to agave. We are planning to plant about 7500 hectares of agave which will require planting 2500 ha. per year. We plan on planting 5000 ha. of potatoes for two years to compare the crop to agave and use the starch to produce ethanol and residues to grow hogs. This will continue if initial production results are good. The advantage of the combined approach means that we can start building an ethanol plant as soon as first year test planting provides data of yields from the two plants and there is strong productivity demonstrated of sweet potatoes. Since sugar beets are grown in Imperial Valley this should be feasible.

- The main advantage of sweet potatoes is that there is a huge amount of biomass that is edible. There is 30% residual from the ethanol plant that can be fed to hogs in wet form if the hog farm is put next to the ethanol plant. The vines and leaves are also edible. The combination of the two provides a balanced feed mix with 18% protein that is suitable for hogs. The feces from hog production can also be used to provide methane for the production of steam. When combined with solar thermal panels to pre-heat water, renewable energy can be used entirely for ethanol refining.

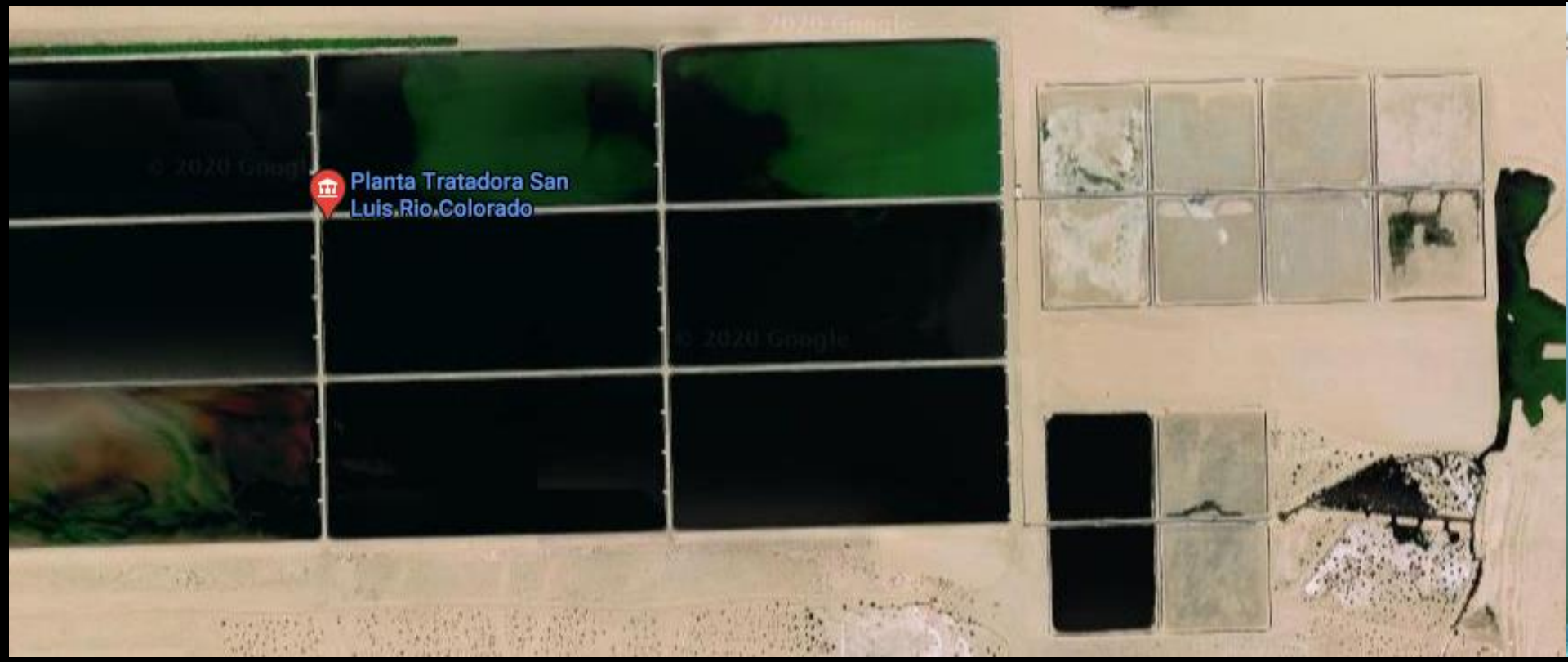
- There are high profits from the combination of ethanol and hog production because of the elimination of feed costs for hogs (only ethanol by-products) which is 75% of costs and because the ethanol is worth more because of lower carbon emissions from having biogas for boiler energy requirements.

San Luis Rio Colorado Water & Wastewater

Description of Main Wastewater Plant
Possible Growing Areas for Agave and Sweet Potatoes

Wastewater Treatment Plant, San Luis Rio Colorado

Limited treatment other than large aeration tanks



Planting Area State of Sonora (San Luis Rio Colorado)

Very short piping distance for wastewater, Very large area

Imperial Valley:

Introducing Low Water Use & High Yield Crops
Agave and Sweet Potatoes

Introducing Technology to Improve Yields, Solve Problems
Diatomaceous Earth, Micronutrients, Ozone

Introducing Low Energy & Low Pollution Pumping
MayMann Generators

Introducing Water & Ethanol Fuel for Diesel & EV Vehicles
MayMann Engines

Planting Agave in California

Introducing Agave, a High Value Low Water Use Crop, to Imperial Valley

- Imperial Irrigation District (IDD) receives 3 out of 4 gallons of water allocated to California from the Colorado River for irrigation. This continued priority for the water is based on not having any wasteful use and fully utilizing its quota.
- Agave uses the crassulacean acid metabolism (CAM) photosynthetic pathway, which allows the plants to shift CO_2 uptake to the night. "Cooler nighttime temperatures reduce the vapor pressure gradient between agaves' leaves and the air, resulting in low transpiration rates. Consequently, CAM confers the ability to agaves to be highly water-use efficient in hot, drought-prone environments." Requirement to grow agave annually is 600 mm per year (5.8 acre inches) vs. alfalfa (common crop in Imperial Valley) at 72-78 acre inches and average of 48 acre inches for all crops. This is only 12% of water needed for normal crops. It can also grow on marginal land where other crops can't grow and is salt and drought tolerant.
- GO3 Carbon CalMexar is planning to introduce agave to IDD through a feasibility study phase followed by a major planting program over a 5 year period that will result in about 25,000 acres of agave being planted. This will be on marginal lands owned by IDD that will be leased to the project with irrigation water rights to demonstrate low water use crop viability. This land is not being used for any crop production because it is not suitable for other crops The project will require 249,000 acre feet of water which is about 8% of IDD's allocation.
- 25,000 acres of agave is sufficient to produce between 53 and 181 million gallons of ethanol. This has a wholesale value including carbon of about $3/gallon or $159-$544 million in economic value and regional impact. This is between $6,360 to $21,770 per acre. The average value of crops in Imperial Valley is about $1,826 per acre (2009 data). This means the economic benefit will be 3.5 to 11.8 times greater than other crops using only 12% of water.
- Additional water resources include surface irrigation water runoff, which is too salty to use for irrigating other crops and municipal wastewater, which cannot be used for food crops. We will explore how to utilize both sources using GCarbon technologies as detailed in slide 80.

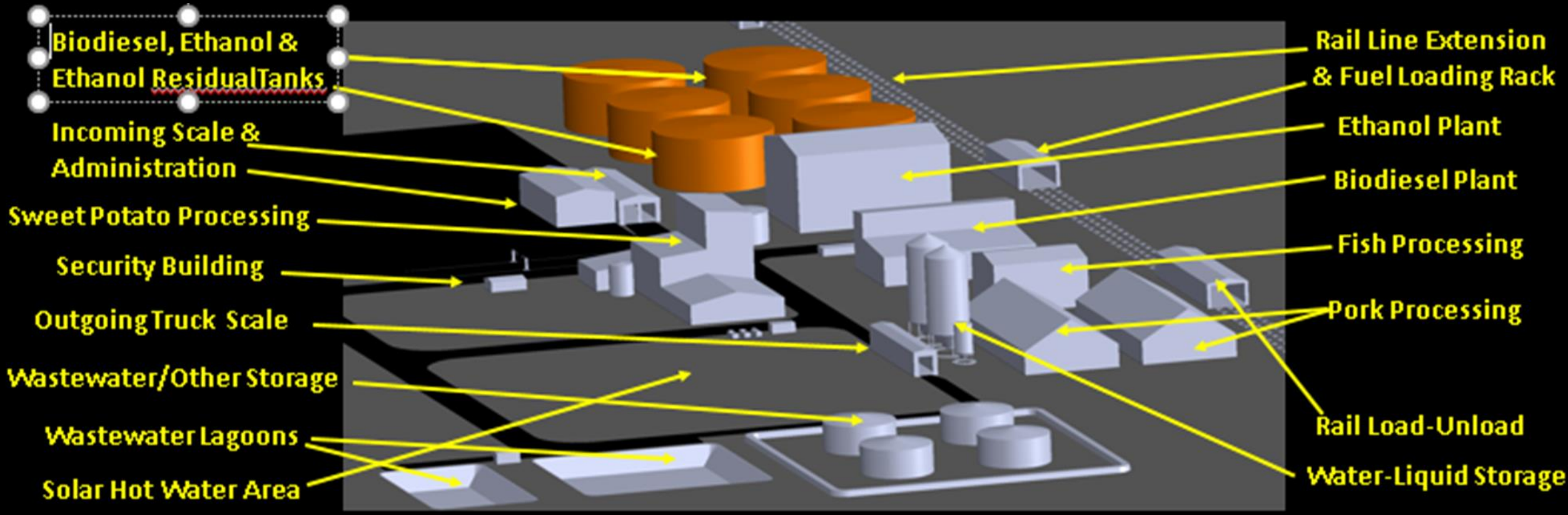
Planting Sweet Potatoes in California

Introducing Industrial Sweet Potatoes, a High Value Crop for Ethanol &Animal Feed

- In parallel with introduction of agave, we will also introduce a 2nd feedstock for ethanol production that has similar productivity but can be harvested in year 1, allowing for building of the ethanol plant as soon as we complete field trials on agave and sweet potatoes
- We plant on working with the USDA research station in Imperial Valley to initiate a field trial of sweet potatoes on different field plots and with different soil types with the goal of obtaining data on the best planting strategies and equipment, input requirements, disease issues, best varieties to plant and yield in different irrigation and soil types.
- In parallel we will be evaluating the various technologies we have to enhance yield such as diatomaceous earth, micro-nutrients and ozone that will be separately evaluated on various plots to understand impacts on plant health, durability and yield.
- Our primary goal is to demonstrate that it is possible to achieve the same or better yields of sweet potatoes achieved on the best farms in Brazil. This has reached up to 100 tons per hectare and we are confident we can meet or achieve this goal using the technology mix.
- The plan is to plant sweet potatoes on a part of the 25,000 acres planned for agave as it will be impossible to plant that many acres without many years to ramp up production of pups for planting (baby agave). In the interim, we will use these acres to plant sweet potatoes. Depending on the relative cost and yield of the two crops we may then expand acres as agave acres reach the 25,000 acres over 5 years. Sweet potatoes are expected to achieve yields of 100 tons per hectare which will allow for production of 14-17,000 liters of ethanol/ha. This is lower than t the yield from agave at the lower end of yield range (176 T/ha) but can be produced in the second year of the project (after field trials) & reduces feedstock risk.
- Planting of 20,000 acres of sweet potatoes will allow for production of 32.8 million gallons of ethanol per year. Equally important, there will be 240,000 tons of ethanol residual and 200,000 tons of vines and leaves. This will provide enough feed for 880,000 hogs per year. At 150 Kg/hog, this will result in production of 99 million Kg of pork meat and viscera to support a major production of fish feed and other elements of the integrated production strategy. We will utilize the integrated strategy already developed in Brazil as a model and demonstrate the high value of the crop and byproducts for Imperial valley.

Ethanol and Food Processing Plant in California

Combining ethanol production with hog production and meat processing

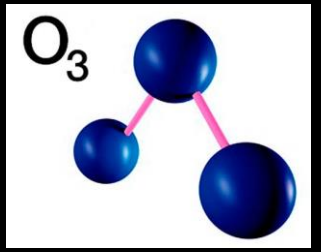


Much higher profits and lower carbon emissions can be achieved by co-locating hog production next the ethanol plant when the primary feedstock is sweet potatoes. We will be setting up an ethanol plant similar to this design in Brazil and are looking at the same design in Imperial Valley. Feed can be provided in wet form to hogs along with vines and leaves to eliminate feed costs and hogs provide biogas to allow the ethanol plant to use 100 renewable energy when combined with solar thermal

Introducing New Agricultural Tech to Imperial Valley

Will use new technologies to lower disease, increase yield, lower salinity for all crops

- An important objective in introducing agave to Imperial Irrigation District (IDD) is to simultaneously look at other technologies that can help reduce agricultural risks, augment farm product values and eliminate problems like disease, soil salinity, drought, etc.
- In the technology section we provide a description of three technologies that we will be using in Mexico to enhance yields of agave and other crops and provide other benefits. These three technologies include diatomaceous earth, ozone and micro-organisms. The combined technologies can help eliminate disease, improve crop value and increase yield by acting on different parts of plants to augment their defenses and growth process.
- The proximity of a diatomaceous earth mine in Baja California will make it feasible to truck the product to the farming land. This will help control insects, worms and improve yield. We will also be using ozone to treat root diseases like verticillium and fusarium, some of the toughest diseases now affecting crops globally. We will also demonstrate the use of micro-organisms to enhance growth rates of crops, lower salinity levels of soil and improve resistance to diseases
- The use of these strategies will not just be for agave. It is impossible for GO3 Carbon CalMexar to plant 25,000 acres of agave in one year. The plan is to plant a total of 25,000 acres by year 5 in intervals of 5000 acres per year. By year 5 we will have this total amount of agave planted but until then will have idle land. In the interim we plan on planting various normal crops like vegetables, lettuce, fruits, etc.
- The main advantage of the product line is that it can be grown organically as the micro-organisms can breakdown any agro-toxins that might be in the soil and provide the same level of plant protection using natural mechanisms. We will use the same approach to eliminate salt from the soil. More importantly, the end products such as vegetables and fruits will have high levels of minerals and vitamins that come from the micro-organisms. The combination of organic produce and higher levels of minerals and vitamins will increase market value. This will demonstrate new methods to turn marginal land into high value agriculture for IDD farmers



OZONE IN AG. = FUNGUS, VIRUS & BACTERIA CONTROL

DIATOMACEOUS EARTH = INSECT CONTROL, YIELDS ++

MICRO-ORGANISMS = HIGH YIELD, SALT CONTROL

Improving Efficiency & Lowering Pollution of Irrigation Pumps

We Will introduce a generator that uses 70% water, 30% ethanol for pumps or other generators

- Most water pumping in California is done using diesel generators because of the cost and distance of irrigation pumps for farms from the electric grid. These generators require a large amount of energy, cause air pollution and are expensive to run.
- One objective of the project is to demonstrate new engine technology that can improve the benefits of ethanol production by increasing engine efficiency and fuel use. One technology we are demonstrating is an engine that uses 70% water and 30% ethanol as a fuel. The engine can cut fuel consumption in half, results in a much lower cost fuel and has much lower air pollution and carbon emissions.
- The initial focus on marketing ethanol-water engines in the near term is with generators as they are much easier to introduce to the market as fuel is a major cost. The goal is to introduce generators to agriculture, mining and telecom markets.
- The introduction plan in the agriculture market will be focused on generators used to run irrigation pumps on farms. These are typically diesel generators from 10 to 40 KW and are operated whenever irrigation pumping is needed in both Imperial and Central Valleys in CA.
- Our plan is to work with the air districts on demonstration projects that show air quality and carbon benefits of the generator operating pumps in their districts. The same company has converted a Ford Focus engine and vehicle to run on their technology with excellent results and a successful demonstration project will pave the way for ethanol-water fueled vehicles in the future.

Improving Vehicle Efficiency & Further Greening Ethanol

We will introduce a set of vehicles that run on 70% water, 30% ethanol for trucks, cars, vans

- We expect to achieve 85-100% reduction in carbon emissions from sweet potato and agave feedstocks to produce ethanol. Even greater carbon benefits can be achieved if ethanol is blended with water and run in modified engines able to use this fuel. This can double fuel efficiency and carbon benefits, so that we achieve carbon reductions of 170-200% versus regular vehicles running on gasoline or diesel.
- We plan on introducing the technology to Imperial Valley in the initial field trial phase of crop introduction to produce ethanol by offering major fleets a chance to swap vehicles or engines with the new technology and setting up storage tanks and pumps
- Fleets can achieve major reductions in regulated air quality emissions, Co2 emissions and fuel consumption by switching this fuel. Fuel consumption can be cut in half and fuel cost will be much lower. This has high economic value to fleets & consumers
- MayMaan also has a range extender for electric vehicles that is particularly useful for large fleets that need range on a portion of their electric vehicle fleet. The use of the range extender can improve reliability, increase range and lower battery requirements that will benefit costs of larger electric vehicles such as delivery vans or trucks.
- Our plan is to work with the air districts on demonstration projects that show air quality and carbon benefits of the vehicles. The company has converted a Ford Focus diesel engine and vehicle to run on their technology and will be converting various engines and vehicles to their technology in 2021.

AQUASTROKE

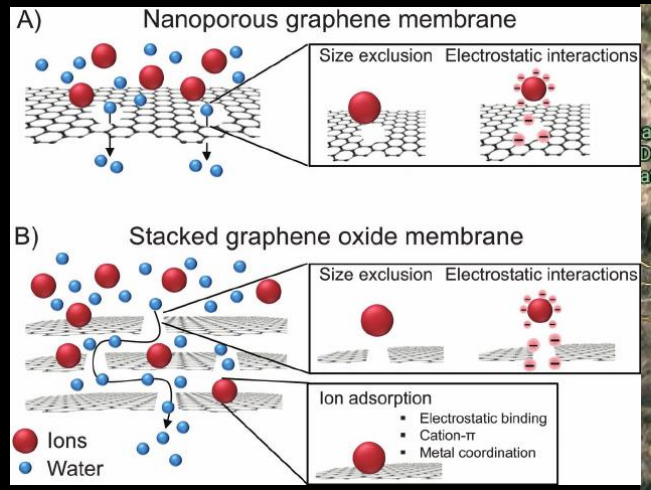
AWARD–WINNING TECHNOLOGY

REINVENTING THE INTERNAL COMBUSTION ENGINE

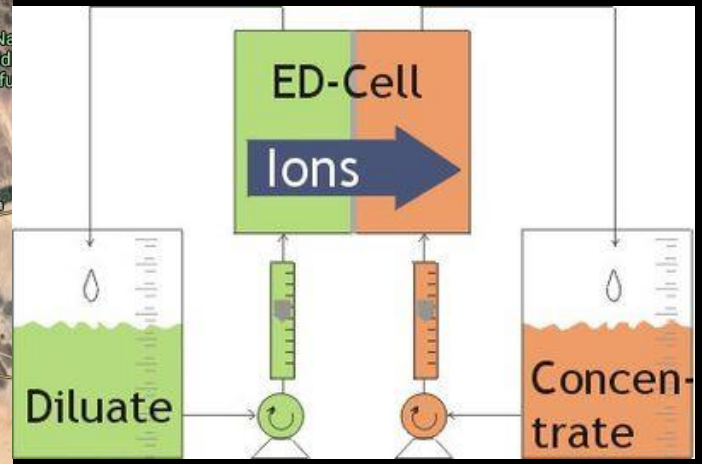
Long-Term Solutions: SaltWater Channel, Desalination Technology.

2 Possible routes to fill the Salton Sea could bring forward new desalination technology

✓ Reverse osmossis is the most common method for desalination and can be combined with solar cells to lower power consumption. Advanced filtering systems can reduce obstruction rates and more water can improve the economy



Graphene Nano Filters with Graphene from Municipal Waste



Electrodialysis & shock waves to separate fresh water out of canal

Electrodialysis can be applied to half the saltwater channel to separate water into salt concentrate and fresh water. This involves an MIT technology that uses solar cells and batteries to separate salt water using electric ion cells that create a separation of salt and fresh water. Half the canal can then fill the Salton Sea and half provide feed water for desalination plants to produce fresh water.

Graphene nanofilters have been developed by U. of Manchester that separate salt from fresh water using graphene screens and electrostatic methods. Graphene is currently very expensive, but a company has developed a system to produce graphene from municipal waste. Combined technologies could allow direct separation of salt water through nanofiltration.

The Technologies:

Wastewater Treatment
Ozone Use in Agriculture
Diatomaceous Earth
Agave and Sweet Potato Ethanol
Fiber & Composites
Advanced Engines Optimized for Ethanol

The Technologies:

Wastewater Treatment

Electrolysis
Ozone
Floculation
Biological Treatment

Electrolysis, Ozone, Floculation, Filtration:

Wastewater Treatment for Water Recycling

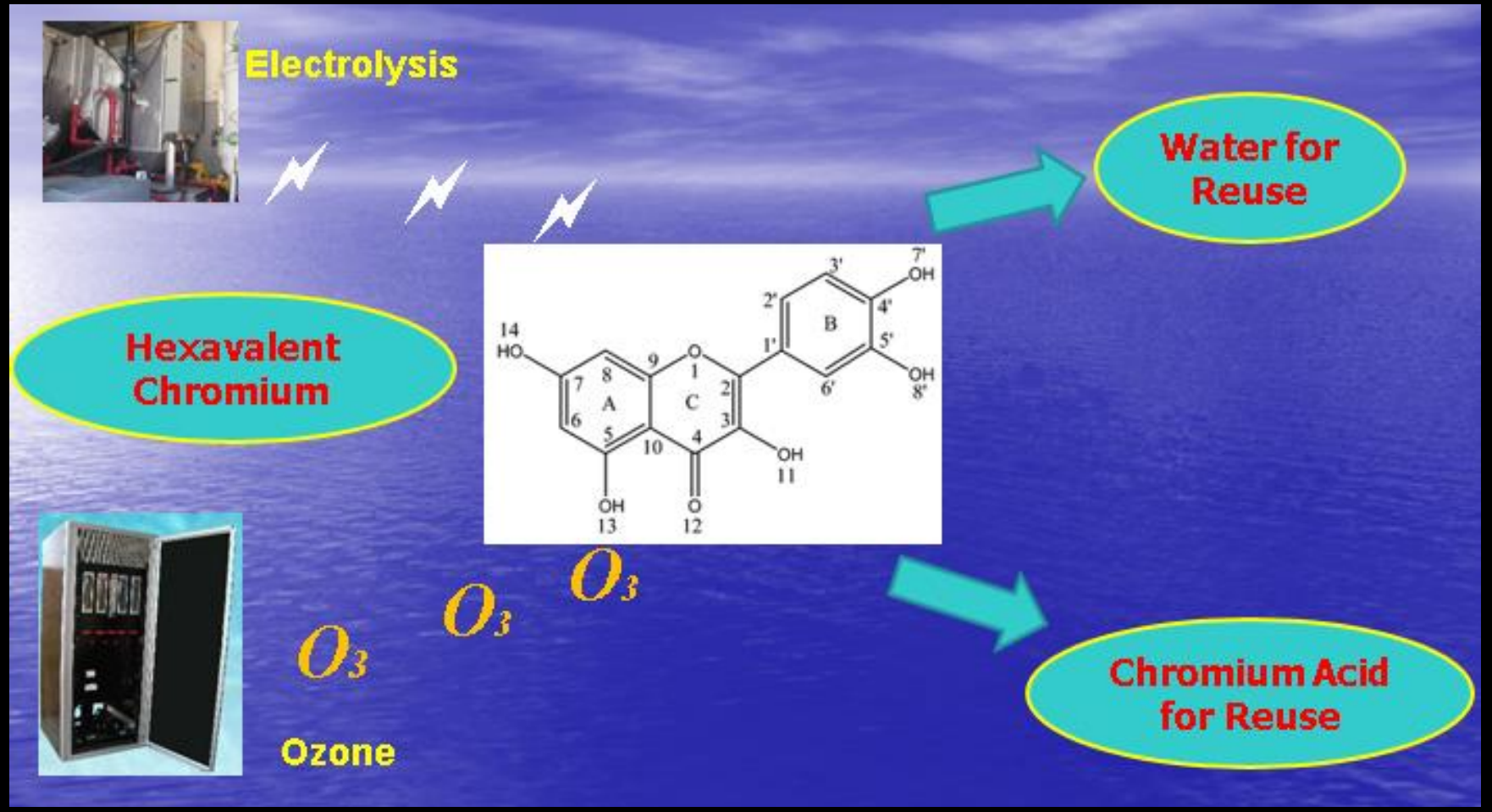
Ozone Unit (our tech)

Electrolysis & Electroflocuation (our tech)

Filtration to Allow Water Re-Use

Electrolysis, Ozone, Distillation:

Chemical Recycling Returns Valuable Chemicals for Re-Use



Able to separate chemicals based on density and return to chemical plant the acids, solvents and heavy metals for re-use

Electrolysis, O3, Equalization for Agave Irrigation:

Treatment That Sterilizes, Removes Smell, Leaves Fertilizer Value

Fully Sterilized Wastewater

Lower Wastewater Treatment Costs

Suspended Solids Provide Fertilizer

Lower carbon footprint for biofuels

Electrolysis to Precipitate Solids

Ozone Unit to Sterilize

Equalization Tanks to Remove Smell

We Manufacture Our Own Ozone Units:

Proprietary Technology for Corona Discharge is Super-Efficient & low in cost

- ✓ We build our own ozone units
- ✓ We have proprietary technology
- ✓ Our ozone costs are a small fraction of other units because we build our own cells
- ✓ Our ozone units are extremely efficient in terms of output per kWh consumed and in terms of space required for an ozone unit

Super Low Energy Use, High Ozone Output, Very Durable

Ozone Is Best Sterilization & Breaks up Molecules:

Proprietary Technology for combining ozone & other technologies for wastewater

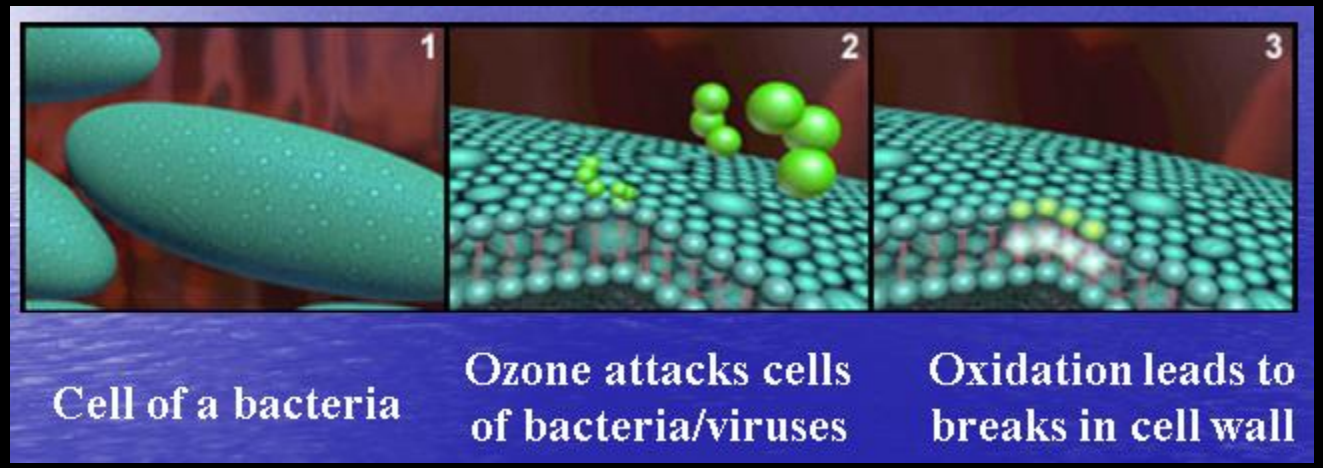
Ozone Kills Viruses, Bacteria & Fungus But Does Not Harm Healthy Plant or Human Cells, With Many Uses in water, health & agriculture

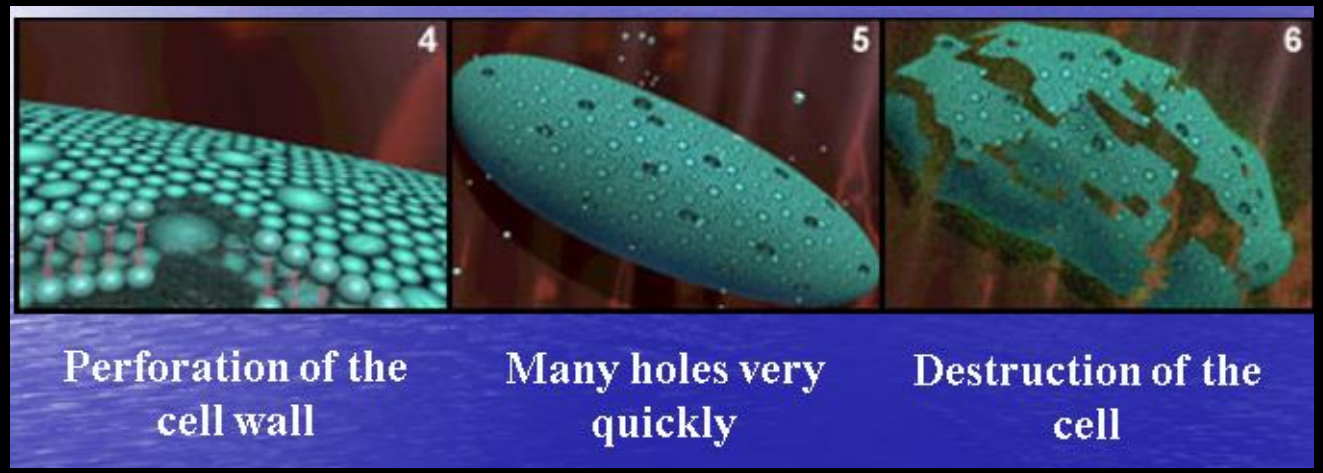
Ozone to Steriize

- 100% disinfection rate
- No residuals
- No cancer causing chloramines
- Lower in cost

Ozone to Break Up Molecules

- Combined with Electrolysis
- Breaks up big molecules
- Causes rapid precipitation of solids
- Improves efficiency of infrastructure





Biological Treatments:

Use of Various Plants and Biological Systems to Treat Wastewater

On Site Treatment with Water Lilies, Cascading Falls

Semi treated wastewater = Valuable Biofuel Crop

Waste is locked into Native Non-Food Plant

Final treatment process = habitat for wildlife

Wetlands Formation for Final Wastewater Treatment

Off site Biological Treatment with Agave

Results: Fresh Water System JAPAMA, Sinaloa

Use of Ozone Only to Treat Very Dirty Water Supply for Los Mochis

Data Obtained from Testing at Los Mochis

- Water Source; Irrigation Canal, Uncountable Colliform level
- Flow volume of 250 liters/second , portion of treatment plant
- Ozone venturi system placed in feed pipe of raw canal water
- 30 kg ozone per day unit used without oxygen
- Pre-mixer contact time of 120 sec. & 90 minutes after clarifier

- **Results After 120 seconds:**
  Total Coliforms: 17 per 100 ml
  Fecal Coliforms: 3 per 100 ml

- **Results After 90 minutes:**
  Total Coliforms: 00 per 100 ml
  Fecal Coliforms: 13 per 100 ml

Very Dirty Incoming Fresh Water Supply

After one Day Ozone Only, water is almost clear
Coliform bacteria level to17 in 2 min., zero after 90 min.

Results: Fresh Water System SIAPA, Guadalajara

Use of Ozone Only to Treat 1000 lps of Water Supply for Guadalajara

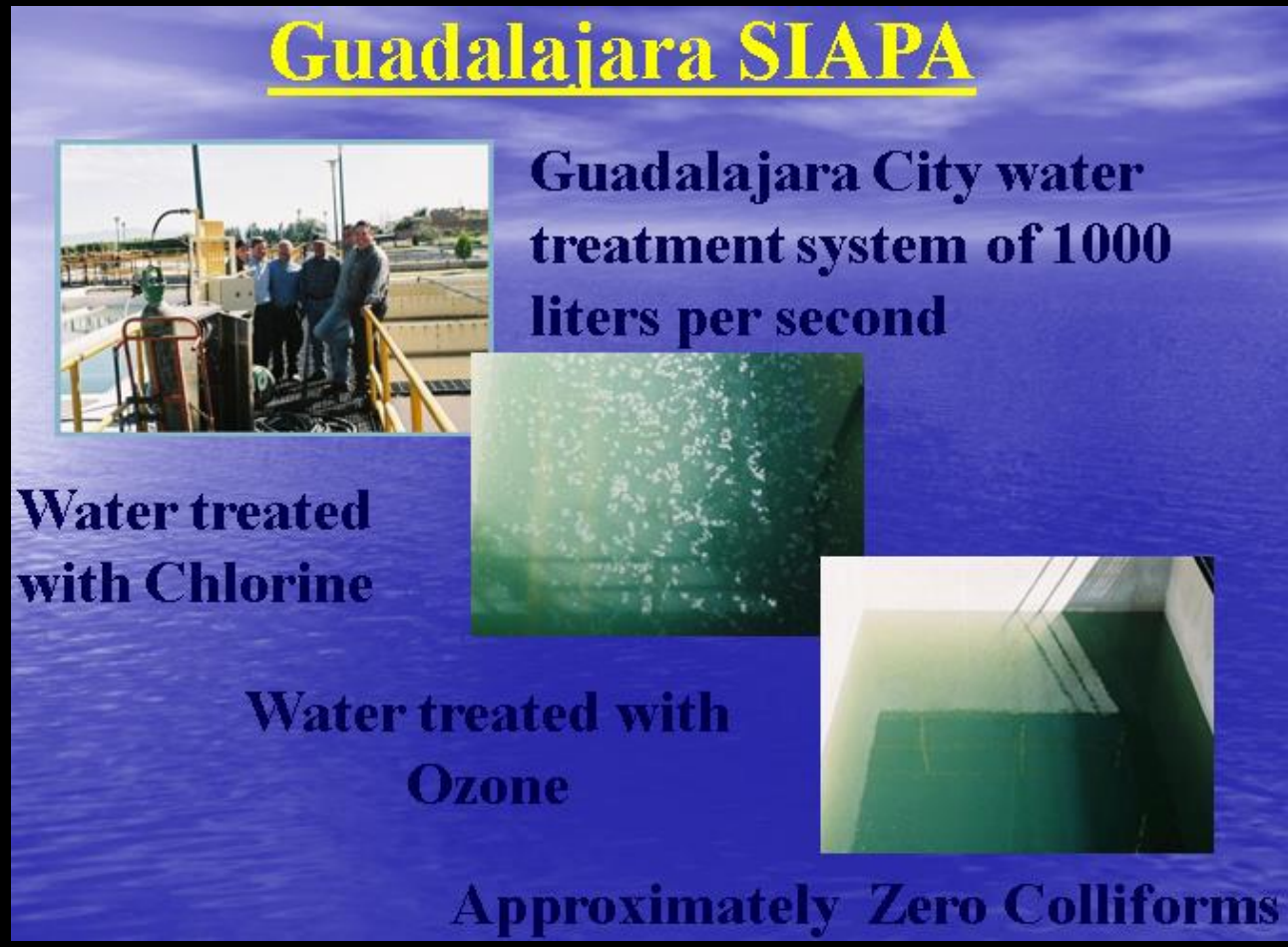
Data Obtained from Testing at Guadalajara

- **Water Source;** Chapala Lake, Uncountable Coliforms
- **Flow volume:** 750-1000 liters per second in two identical modules treated side by side, one with chlorine, one with ozone
- **Ozone venturi** system was placed after clarifier and before filters
- **30 kg ozone** per day unit used, most of the time without oxygen
- **Pre-filter** contact time of 3 minutes and 90 minutes after filter

- **Results on day 1:**
- **Total Coliforms:** Non-Detectable (ND) in pre-filter & after filter
- **Fecal Coliforms:** Non-Detectable (ND) in pre-filter & after filter

- **Results on day 2:**
- **Total Coliforms:** 2 coliform/100 ml in pre-filter & ND after filter
- **Fecal Coliforms:** Non-Detectable (ND) in pre-filter & after filter

Very Cloudy Results Treating with Chlorine



From uncountable coliforms from source to zero coliforms in only 90 minutes

Results: Wastewater System CESTPE, Tecate

Use of Ozone Only to Treat Wastewater for Tecate, N. Baja CA

Data Obtained from Testing at CESTPE Tecate

- **WasteWater Total Coliforms;** 30 Trillion
- **Flow volume** 175 liters per second
- **Ozone venturi system** in raw wastewater before contact tank
- **30 kg ozone per day** unit used, with & without oxygen
- **Contact time** of 10 seconds (1st sample) & 90 seconds (2nd sample)

Results on day 1 (CESTPE LAB):

Total Coliforms: 3.5 billion (after 10 sec.), 8 million (after 90 sec.)
Fecal Coliforms: 2.4 billion (after 10 sec.) and no data (90 sec.)

Results on day 1 (Independent LAB in Tijuana):

Total Coliforms: 16,000 (after 1 1/2 hour)
Fecal Coliforms: 16,000 (after 1 ½ hour)

Results on day 2 (CESTPE LAB):

Total Coliforms: 300,000 (after 90 seconds) (with oxygen)
Fecal Coliforms: 180,000 (after 90 seconds) (with oxygen)

CESPTE

COMISION ESTATAL DE SERVICIOS PUBLICOS DE TECATE

FECHA : 15 DE ABRIL DE 2005

MUESTRA : AGUAS RESIDUAL TOMADA EN ENTRADA Y SALIDA DE CAJA DE CONTACTO EN EFLUENTE PLANTA DE TRATAMIENTO DE AGUAS RESIDUALES DE TECATE

TOMADA Y ANALIZADA : ING. VICTOR MANUEL LOPEZ ALVAREZ

RESULTADOS:

PARÁMETRO:	ESTANDAR:	RESULTADOS	
		AGUA RESIDUAL ENTRADA	AGUA RESIDUAL SALIDA
COLIFORMES TOTALES (col/100 ml.)		3,500 x 10^6	120 x 10^6
COLIFORMES FECALES (col/100 ml.)	<1,000 col / 100 ml.	2,400 x 10^6	90 x 10^6

COMENTARIOS:
PRUEBA DE OZONO , COMPAÑÍA ELECTROZONE , SEÑOR PAYAN SE MOSTRO UNA REDUCCION, PERO TODAVIA NO SE CUMPLE CON LA NORMA.

ELABORO:

ING. VICTOR MANUEL LOPEZ ALVAREZ

From 30 trillion coliforms at entry to 300,000 coliforms in only 90 seconds (with oxygen)

The Technologies:

Agricultural Applications

Ozone use in Agriculture
Diatomaceous Earth
Micro-Organisms

Ozone & Diatomaceous Earth

Ozone & Diatomaceous Earth Can Double Yields, Eliminate Diseases

Data Obtained from Testing at Las Palmas Farm, Other

CORN

- **Corn;** Applied diatomaceous earth when planting via irrigation
- **Corn:** Diatomaceous Earth can also be used to control worms
- **Health Benefits:** corn has high levels of silicates essential for building up ligaments, tendons & bone health from Diat. earth
- **Small Amount** per treatment means it is very cost effective
- **Yield** has risen to 32 MT per ha. per harvest in not particularly rich soil and with tough growing conditions (hot sun, wind, etc.)
- **Average Yield** of corn is about 4-8 tons in Mexico (4-8 times better)

BEANS:

- **Beans:** Applied diatomaceous earth when planting via irrigation
- **Yield:** Was able to double yield of lima bean crop
- **Diseases:** Had no problems with diseases

CHICKENS:

- **Less diseases** in chickens, more meat, more eggs laid, bigger yolks

GOAL:

We plan to work with the local agricultural Univerisity to document yields achieved in corn, beans, chiles and other crops and then introduce the technology package in all agricultural projects. We will also work with IDD and Univeristies in California to test tech.

Diatamaceous Earth/Ozone delivered by irrigation

Farmer in Las Palmas Valley has doubled crop yields
Farmer now has top corn yields in Mexico (32 MT/ha)
This is even while growing corn in a desert!

Our Own Diatomaceous Earth Mine

We are mining diatomaceous earth in our own mine in Las Palmas

Diatamaceous Earth Mined & Sold Locally in Baja

MINE & WAREHOUSE

- **Equipment;** Limited heavy equipment on site for mining
- **Product:** Diatomaceous Earth is mined and shipped to Las Palmas
- **Storage:** We have a warehouse when final screening of diatomaceous occurs and bagging in 25 Kg bags for shipment
- **Other Packing** for consumers is being done through subcontract
- **Production Costs** are very low allowing us to sell diatomaceous earth at prices that make it feasible for agriculture
- **Cost Effective** applications are being demonstrated as mining capacity is increased so we can sell all products that we process

MARKETS:

- **Agric.:** local market interest is accelerating due to early successes
- **Organic Corn Meal:** Special properties make it highly valuable
- **Agave:** will use in agave to increase yields & avoid diseases
- **Health:** there is a strong demand for diatomaceous earth in health food stores, alternative med clinics because of health benefits

GOAL:

Match Market demand to production capacity while ramping up so diatomaceous earth can increase yields in all local agriculture

Locally Available BAJA CA Diatamaceous Earth

We are currently mining diatomaceous earth in a mining operation in Las Palmas and selling the product to health stores and agricultural users

DIATAMACEOUS EARTH = HIGH EFFICIENCY AGRICULTURE
IRRIGATION & DIA-EARTH = SMART HIGH YIELD FARMING

Microbiological solutions for salinity and performance

We will introduce various solutions to reduce salt in the soil, increase yield

MICRO-ORGANISMS & AGRICULTURE

Concept; specific microorganisms to solve soil problems

Product: The reproduction of different cultures is carried out on a macro scale

Costs: Once trials demonstrate the efficacy of cultivation on specific plants, implement cost-effective area-based options to treat Irrigation ponds can be used to grow organisms on a large scale Soil contamination is an important work area as it has demonstrated the ability to remove toxins from the soil and remove salt Profitable applications will be evaluated in the study phase

Markets: Salinity tests will focus on high salinity soil areas

Organic Transition: Elimination of toxins from the soil - Organic certification

Yield: The yields of some crops can have double the yield with right organisms

Health: there is a strong demand for organic products and healthy food, microorganisms provide superfood nutrients, minerals, vitamins

Goal: Evaluate microorganism technology alone and in combination with other technologies to improve yield, solve soil problems, improve the value of

Nueva tecnología latino Americana para utilizar microorganismos

Iniciará programas de pruebas en Baja, Sonora, Imperial Valley en California

- **MICROORGANISMOS : AGRICULTURA DE ALTO RENDIMIENTO**
- **MICRONUTRIENTES TRANSFERIDOS A ALIMENTOS**
- **LOS PROBLEMAS DE SALINIDAD DEL SUELO Y METAL SE PUEDEN RESOLVER**

The Technologies:

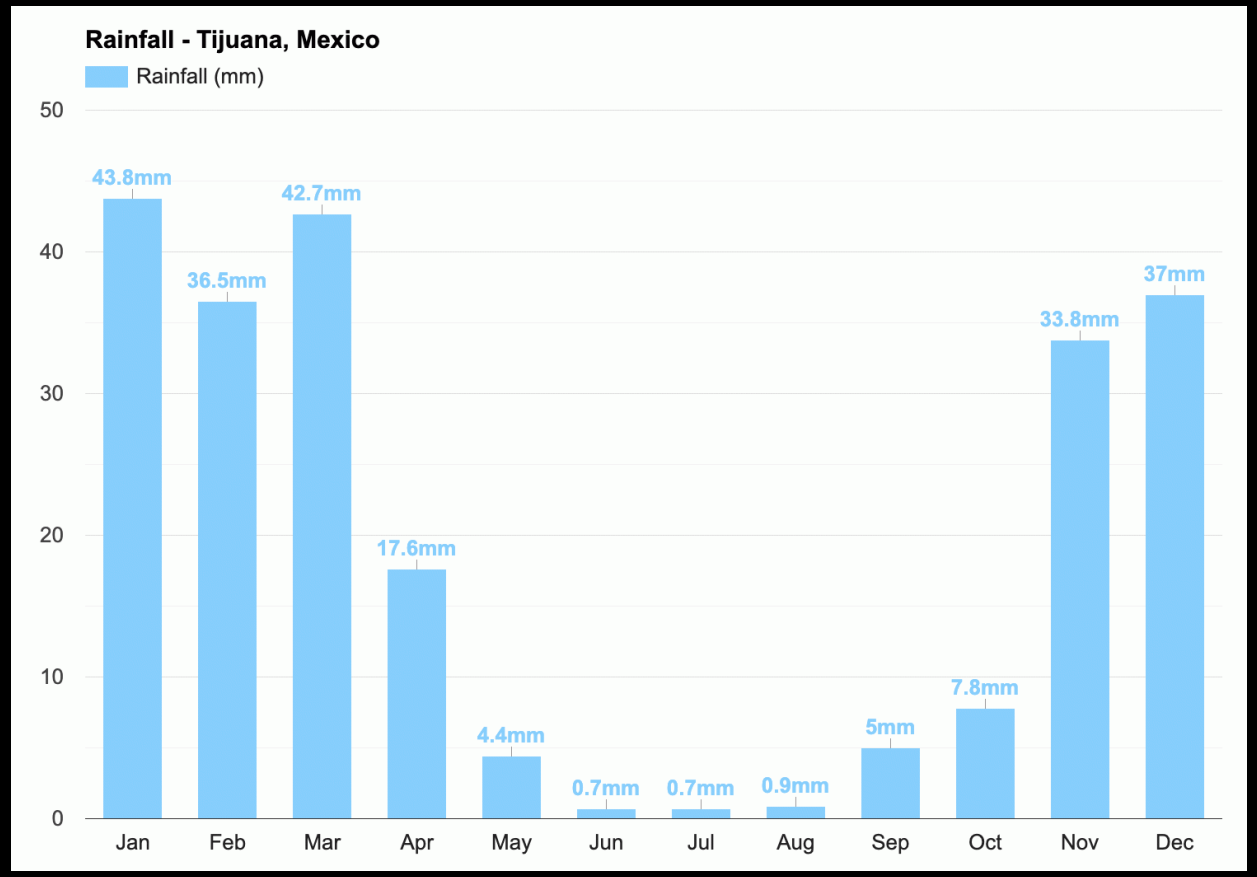
Agave, Sweet Potatoes

High Yield Agave
Sweet Potatoes

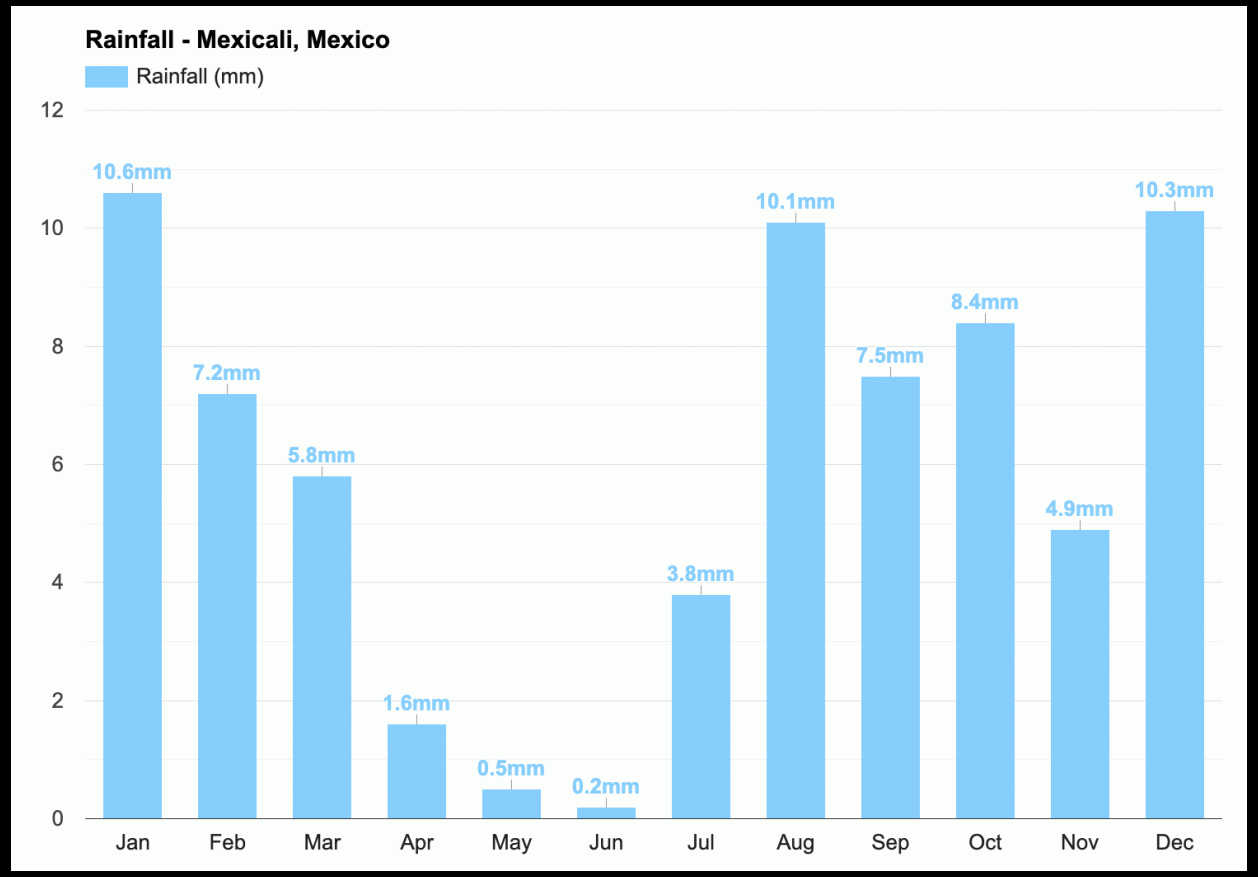
Rainfall in Tijuana & Mexicali, Baja CA N.:

Low Precipitation but will add to irrigation amounts

Tijuana Rainfall per month



Mexicali Rainfall per month



Tijuana Annual Rainfall is 291 mm per year

Mexicali Annual Rainfall is 71 mm per year

To be conservative and account for evaporation losses we have not included rainfall in production estimates

Summary: Waste Water Biologically Treated & Agave Results

Type of crop & Min. Water: Blue Agave, special hybrid variety, 600 mm per year

Irrigation Volume Available: 1 liter/second of irrigation water equivalent to 8.6 mm of rain/day

1 liter/sec = 8.6 mm/day * 365 = 3,139 mm per year
To achieve 600 mm/ha need 0.2 liters/sec. + evaporative loss, 0.5 l/sec

Rainfall Available: Mexicali: 71 mm/year Tijuana: 231 mm/year (not counted in total)

Area Can Irrigate: 2900 liters per second will allow for irrigation of 12,000 hectares in TJ
1888 liters per second will allow for irrigation of 7552 ha. in Mexicali

Ethanol from 19,500 ha. **harvest 3,910 ha. yr.= 103 million to 402 million gallons per year**

Total Water/Agave TIJUANA **2900 lit/second = 12,000 ha. = 2400 ha./year = 2.1-8.4 mil. MT agave**
Low Yield Estimate - 880 T/ha: 420,000 MT sugar, 210,000 MT ethanol (63 million gal/year)
High Yield Estimate -3500 T/ha: 1.7 million MT of sugar, 840,000 MT of ethanol (252 mil gal./year)

Total Water/Agave MEXICALI **1888 liters/second =7,552 ha. = 1510 ha./yr.= 1.3-5.3 mil MT agave**
Low Yield Estimate - 880 T/ha: 266,000 MT of sugar, 133,000 MT of ethanol (40 million gal/year)
High Yield Estimate -3500 T/ha: 1.06 million MT sugar, 500,000 MT of ethanol (150 mil. gal/year)

Comparison of Yields of Agave Vs. Cane & Sorghum

Variety Y & Z are hybrids only in 2nd year of evaluation so data is not validated yet

AGAVE VS OTHER CROPS

	agave X	agave Y	agave Z	sugar cane	energy cane	sorghum
yield/ha (tons)	880	2000	3500	100	200	70
growth cycle (yrs)	5	5	5	1	1	0.5
yield/ha/yr (tons)	176	400	700	100	200	140
fermentable sugars %	20%	25%	20%	14%	8%	10%
sugar/ha/yr (tons)	35.2	100	140	14	16	14
fiber %	30%	30%	30%	25%	30%	15%
DryMatter/ha/yr (tons)	52.8	120	210	25	60	21
Type land use	semi-arid	semi-arid	semi-arid	optimal	optimal	optimal
Water requirement (mm/year)	500	600	600	2,000	2,000	875
Fertilizer requirement (N:P:K)	0:00:00	100:50:50	100:50:50	300:150:150	300:150:150	100:50:50

Agave Farm

Shoots (Pups) and Nursery

Planting Equipment

Farm with Early Stage Agave

Life Cycle of Agave

Nursery, field planting, maturing, harvest of bulb with sugar

Agave with Irrigation, Opportunities for New Tech.

Advanced Tech with Irrigation, agave customer in Sonora

We will be integrating various technologies in connection with irrigation of agave. Most agave production does not use irrigation but in Baja and Sonora it can greatly increase yields because there is very Little rainfall.

Irrigation offers opportunities to introduce new technology for adding micro minerals and micro nutrients using diatomaceous earth and micro-algae.

We can also control diseases by applying diatomaceous earth on the plant to kill insects and ozone in the roots to kill viruses and bacteria. Some of this technology is being applied for a customer in Sonora that will assist us in growing agave.

Irrigation with wastewater offers opportunities to use residual solids as fertilizer by sterilizing and eliminating smells so that carbon benefits of the biofuel are improved.

Agave Project in Sonora: Large Opportunities for Growth

Potential to plant 25,000 ha. agave in Sonora with river water

The farming company we are working with in Sonora has a strong interest in expanding its production of agave to meet demands in etanol markets

Sonara has large land áreas that are under-utilized because it is far from major population centers and population density is low. There is a lot of wáter at certain times of the year from full rivers catching rainfall in the mountains.

We estimate that about 25,000 hectares of land is available for growing agave (now used mostly for cattle at very low density). This would provide between 25 million to 75 million MT of raw material a year which would produce 12.5 to 37.5 million MT of sugar and 6.25 to 18.8 million MT of etanol (1.9 to 5.6 billion gallons of etanol worth $5.5 to $17 billion USD). This is a much higher value than any other use of farm land in the región and Will provide Good profits for farmers and lots of zero emisión etanol for California

Sweet Potatoes: Feedstock to Supplement Agave

Sweet Potatoes can Provide High Yields, Harvest in First Year

Our strategy for bringing ethanol on line in year 1 of Project start-up is the planting of sweet potatoes. This is because harvest can occur in year 1 and provides a means to fully utilize allocated hectares and wastewater.

A very special variety of sweet potatoes developed in Brazil can achieve yields of 80-100 tons/ha/year. While we do not know exact yields that can be achieved in Mexico or California, we are confident we can reach this goal with the right mix of advanced technologies. This compares to agave at low end at 176 T/ha./year.

We are working with the technology developer on a Project with Coop Etanol, a national coop set up in Brazil to promote planting of sweet potatoes to make ethanol.

We plan on introducing the same technology to Mexico and the USA through field trials in agricultural research centers and through our own trial planting. We Will be ready to plant potatoes at full scale starting in 2022. This Will be done jointly with growing hogs as part of the integrated strategy previously discussed.

The Technologies:

Fuel & Automotive Technologies

Composite Technology
Advanced Engines Optimized for Ethanol
Water-Ethanol Engines & Vehicles

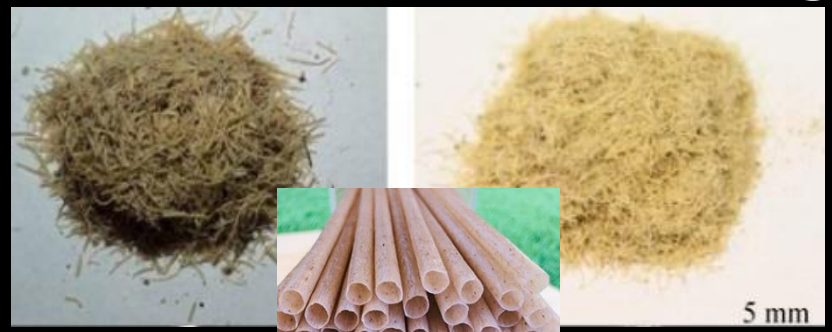
30% of Agave is Fibers – Advanced Composite Options

Tijuana can be major center for composite & plastics manufacturing

Large scale production of agave will result in big quantities of agave fibers as a by-product. These fibers can be used in production of composites for automotive & consumer products that have both high strength or that are for less expensive than other fiber options.

Agave fibers have high tensile strength vs. other wood fibers. Agave is suitable for use at a minimum of 20% by weight in the mix and maximum of 40%.

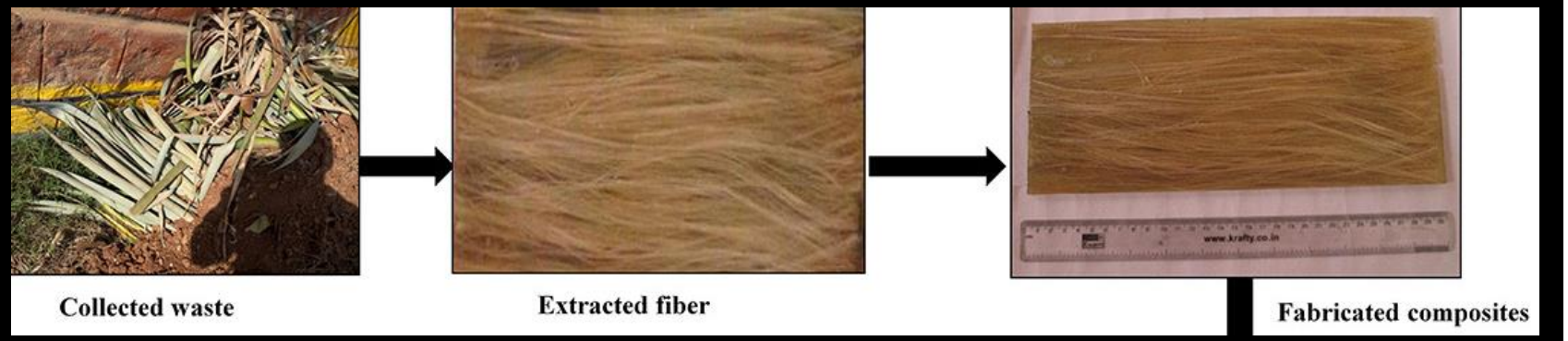
The combination of large volume fiber availability and existing resin and plastics production will allow Tijuana or Mexicali to become major composite production centers for automotive and consumer electronic parts and other plastics based manufacturing

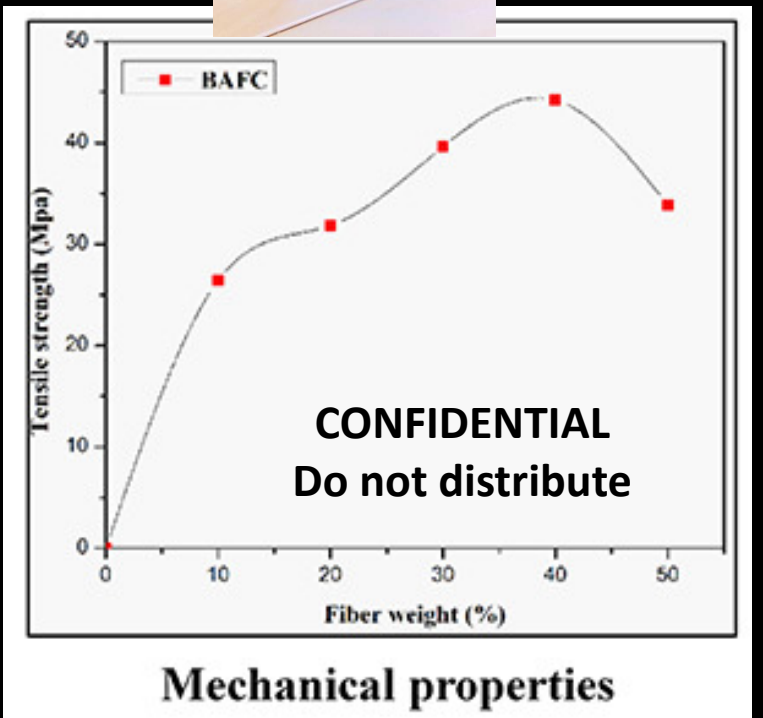


Small waste fibers

Agave bio-degradable straws

Longer fibers for composite production



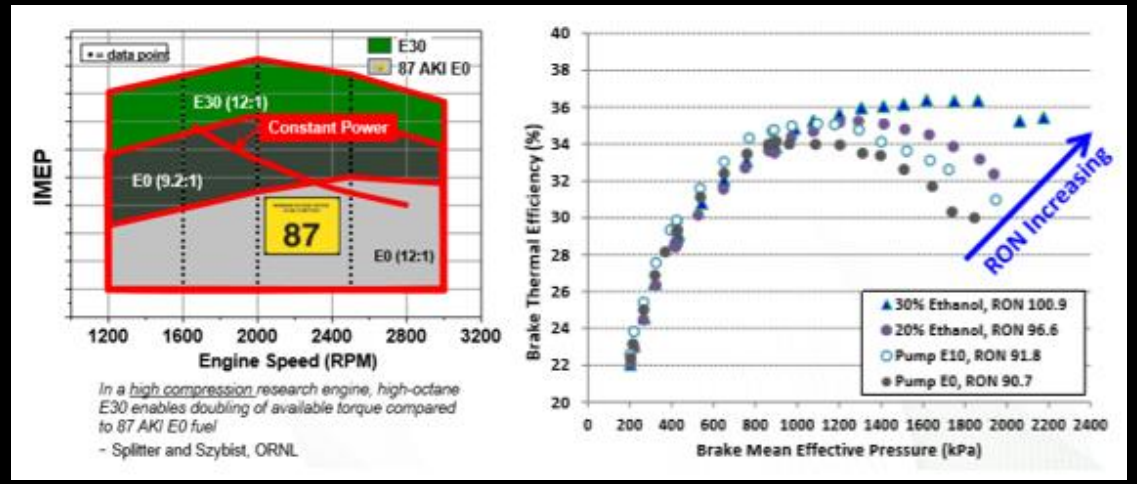


Mechanical properties

No Fuel Efficiency Loss as a Result of Advanced Engines

High octane of ethanol can allow advance of timing and no fuel efficiency loss for ethanol

- High octane of ethanol allows engines to be optimized for this fuel by adjusting RPM so that available torque can be doubled in high compression engines without engine knock
- Higher torque means higher fuel economy so that there is no efficiency penalty from higher blends of ethanol even though the energy content of the fuel is lower. Existing engines can easily be modified to accept 30% blends of ethanol & benefit from improved performance/efficiency
- The high yields per hectare of agave makes it feasible to grow sufficient feedstock to meet a 30% ethanol goal by 2030 using only 3 5 to 9 million hectares hectares vs. 33 million hectares if met by corn. 6 mil. ha. is only 2% of US crop land
- It is only possible to consider 30% ethanol in gasoline if carbon reductions are at -85%-100% or it does not solve carbon problem and does not get legislative & consumer support. GCarbon can achieve this with agave ethanol



30% ethanol in all US gasoline will require 26 billion gallons of new ethanol capacity
85% Co2 benefit = -480 billion lbs. Co2/yr.
Market value of $77 billion with LCFS & fuel

New Water-Ethanol Mix Possible With Advanced Engines

New engine technology allows diesel &spark engines to use a 70% water, 30% ethanol fuel

We have identified an engine development company, MayMann, that has developed an engine technology that is able to operate on a 70% water 30% ethanol fuel mix.

The engine involves minor changes to fueling and piston design to accommodate the changes in fuel combustion that occur with water in the fuel mix. These changes can easily be incorporated in manufacturing or rebuilding of engines.

The company is currently focused on generator and range extender applications in the USA but is in parallel approaching major auto companies about using engine technology in new cars. Brazil has in place the ethanol infrastructure and benefits related to export of excess ethanol that make it attractive.

Various technical developments are underway to gain acceptance in larger fleet and vehicle markets globally. This is important when looking at a major ethanol push in North America as it at least doubles Co2 benefits & lowers fuel costs.

Engines using 30% ethanol /70% water
Introduction in generators & range extenders
At least doubles carbon benefits of ethanol
Intro in Brazil most likely start in vehicle market

Study Proposal:

Monitor Industrial Wastewater Sites
Treat Wastewater with Mobile Test Unit
Complete Pipeline Right of Way Assessment
Complete Land Evaluation for Planting Agave & Potatoes
Complete LCFS Analysis to Confirm Life Cycle Co2 Benefits
Energy & Cost estimate of hydro for Colorado-TJ Pipeline

Study: Monitor Pollution, Test Treatment, Design Plants, Agave

1) Monitor various industrial park waste discharge pipes to determine characteristics of discharge
2) Test equipment that can separate out chemicals and clean water (ozone, electrolysis)
3) Provide data showing effectiveness of technology in separating wastes and processing for reuse
4) Evaluate current energy use for pumping of water & waste, define conservation & hydro options
5) Present data to water agencies and industrial parks about proposed water & chemical reuse plan
6) Sign up industrial parks to participate in the implementation phase and discuss recycling benefits
7) Develop preliminary design and cost estimate of on-site or group industrial wastewater treatment
8) Develop designs for retrofit of municipal wastewater plants and new plant & cost for construction
9) Estimate water quality after treatment and suitability for industrial re-use or agriculture
10) Undergo cost-benefit analysis of the alternative uses for treated water (agave, grapes & potatoes)
11) Complete pipeline/dam right of way study detailing route, land rights, cost for right of way and dam
12) Complete assessment of land available for planting agave/potatoes, ownership, purchase price, lease terms, JV arrangements and options to grow agave/potatoes in Baja & Sonora Mexico and California
13) Complete LCFS analysis of agave & potato ethanol given assumptions of planting area & irrigation
14) Cost-benefit analysis of wastewater for agave, potatoes & grapes vs. traditional treatment/new supply

Mobile Treatment Facility:

- We have developed a mobile treatment facility that is designed to treat industrial park and municipal wastewater by diversion of wastewater to undergo an on-site treatment using ozone, electrolysis & electro-flocculation

- We will improve this facility to add some new equipment and better data gathering capacity so it can be used to demonstrate ability to separate solids, chemicals and solvents from the wastewater and clean up the water for re-use.

- The demonstration will confirm exact design requirements for treatment of industrial wastewater at the industrial park or through construction of a treatment plant at the industrial park area and for each of the municipal sewer plant upgrades

Study Proposal Budget: $500,000

(Possible funding from US EPA &/or private donors/investors &/or NADB)

ACTIVITY	TIMELINE	COST (US$)
- Complete sewer monitoring and pilot plant testing	Months 1-6	$200,000
- Develop designs for industrial and municipal wastewater treatment	Months 2-3	$65,000
- Develop plan for rerouting of industrial pipes to a chem recycling plant in Mexicali	Months 2-3	$25,000
- Complete right of way study of Tijuana and Mexicali wastewater pipelines to deserts	Months 1- 4	$15,000
Complete designs and costs to upgrade facility abandoned in Tijuana (600 lps)	Months 1- 4	$20,000
Energy efficiency plan for pumps, cost estimate of adding hydro to Colo. Aqueduct in TJ	Months 1-4	$15,000
Present retrofit plan for industrial & municipal plants to water & govt. agencies,	Months 3- 4	$10,000
- Visit tech suppliers (aga. & pot), import seeds, grow seedlings, evaluate planting areas	Month 1-6	$30,000
- Feasibility study on growing 25,000 acres of agave/potatoes in Imperial V. & Mexicali	Months 1-6	$30,000
- Complete field studies on ag productivity tech, irrigation plan, immigrant plan	Months 1-6	$20,000
- GREET modeling and market analysis of ethanol & other products	Months 3-6	$30,000
- Travel costs and 5% administrative fee		$65,000
TOTAL COST		$500,000

Why a Feasibility Study-Pilot Project is Needed:

1. No Chemical Recycling Technology = No Wastewater for Ag
2. No Chemical & Water Recycling = No Excess Water
3. No Chemical recycling = dumping continues, waste plants fail
4. No evaluation of how to fix Mexico plants = Big US plant
5. Big USA plant may not get wastewater in future if MX needs water
6. USA plant may also fail because of chemical spikes from dumping
7. No repair of wastewater plants means raw sewage to beaches
8. No raw sewage to beaches or US rivers if pipeline sends to desert
9. Much cheaper to build treatment capacity in Las Palmas vs. TJ
10. Impossible to decide if agave/potatoes feasible without further study
11. Potential of tens of thousands of jobs if choose to reuse water
12. Important solution to zero emission ethanol needs data & studies
13. If no real progress, pollution, loss of real estate values, health issues

Markets and Benefits:

Benefits Consistent with Frontier 2025

Job Benefits, 10 thousand new jobs

Immigration Solutions

Co2 Reductions Agave & Potatoes, Value of LCFS Credits CA

Income & Market Potential

Water Pollution & Climate Change Benefits

Global Co2 Emissions, USA & Transportation Share

Project Benefits: Frontier 2025 Goal 1: Air

Big improvement in air quality, lower carbon and methane emissions

Goal 1: Air	Current Situation	Major Outcome & Benefits
Reduce vehicle emissions by establishing or strengthening programs that reduce # of vehicles that do not comply with vehicle standards 	• CA Goal of 20% reduction In fuel carbon intensity by 2030 only at 8% and not enough viable near term options to switch fuels	• Mexico production of 104 million to 392 mil. gal. of zero emission ethanol using wastewater for water & fertilizer • US production of 56-150 mil. gal. of zero emission ethanol on marginal land in Imperial Valley to demonstrate super low water use high value agriculture with agave & potato • Lower Co2 emissions in CA of 0.8-2.9% from agave/potato ethanol & 1.6-5.8% if all ethanol blended with 70% water • Quantify air quality benefits from reducing methane emissions by improving wastewater treatment efficiency • Quantify air quality benefits from eliminating wastewater discharge in New and Tijuana rivers by rerouting water to desert to grow agave. Evaluate ability of agave to trap sand and lower dust emissions
Deploy strategies and technologies to reduce pollutant emissions and improve public health outcomes	• Mexican vehicle and truck fleet is old with high pollution levels. Clean fuel& engines is best pollution control option	• Double carbon value of ethanol use by working with engine development company with engines that use 70% water and 30% ethanol for cars, trucks and generators • Work with truck and delivery fleets in USA and Mexico to introduce fuel efficient low emission engines that will gain rapid market share because of lower fuel cost

Project Benefits: Frontier 2025 Goal 2: Water

Big improvement in water availability, reuse %, wastewater treatment

Goal 2: Water	Current Situation	Major Outcome & Benefits
Improve drinking water & wastewater treatment infrastructure	• Not enough water, 20% lost • 25% wastewater not treated	• 1600 liters/sec of industrial wastewater recycled which increases water supply by 30% • Treatment % increases to 95%+ of all wastewater • No flow of untreated wastewater to Pacific & TJ River
Improve O&M of drinking water and wastewater infrastructure	• High pumping & chemical costs, lost revenues from leaking infrastructure	• Recover lost energy from adding hydro to aqueduct • Eliminate need to pump 1900 LPS to San Antonio de L.B. • Complete Tecolote La Gloria treatment plant using new technology and biological treatment systems
Promote beneficial reuse of treated wastewater & conservation of water and energy	• Water reuse less than 4% • Limited effort to conserve energy & high electric use	• Treated industrial wastewater re-used in industry • Less demand by industry frees up water for other uses • Reuse of municipal wastewater goes from 4% to above 90% with most wastewater used for non food agriculture by yr. 5 or fully treated for use by vineyards • Energy use sharply reduced from eliminating pumping that is not really treating water, moving water to where it is valuable, eliminating double waste treatment • Zero emission fuel is created from reuse of wastewater • Displace petroleum fuel from agave & potato ethanol

Project Benefits: Frontier 2025 Goal 2: Water

Big improvement in water availability, reuse %, wastewater treatment

Goal 2: Water	Current Situation	Major Outcome & Benefits
Implement projects to prevent & reduce levels of trash & sediment from entering high priority binational watersheds. Prevent marine liter by focusing on solutions at the source	• Tijuana River Canal has open waste channel that leads to high silt & pollution • New River channel has high sediment loads from illegal waste discharge from industrial & residential wastewater sources	• Putting all wastewater in pipes and separating treated and untreated wastewater and sending it to the desert will turn toxic silt streams into manageable runoff silt • Eliminating chemical pollution from entering waste stream from industrial water & chemical recycling will make it much easier to clean up waste & trash • Completing La Gloria wastewater plant will eliminate 600 liters/sec. of wastewater with high silt load • building dams and biological treatment of wastes will result in silt settling into ponds and without toxins
Improve access to transboundary water quality data	• Data from state agencies is not always publicly available	• Study of wastewater at industrial plants will provide data about chemical and solvent discharge levels • Evaluation of wastewater discharges to Pacific in defining build plan for La Gloria and San Antonio L.B. & will provide 3rd party data on quality of wastewater • Re-routing industrial wastewater to recycling locations that will keep data on water quality improvements and monitor carefully any wastewater discharged

Project Benefits: Frontier 2025 Goal 3: Waste

Promote Sustainable Materials & Waste Management and Clean Sites

Goal 3: Waste	Current Situation	Major Outcome & Benefits
By 2025, share information and experiences on sustainable materials management and circular economy practices with local & state level institutions	• No recycling of chemicals occurs in Tijuana and Mexicali industrial parks even through this is a major and highly toxic pollution source that has high value in a circular economy	• Separate chemicals and solvents from industrial wastewater streams and sell back at discount chemicals and solvents for re-use in industrial process • Provide clean water for industrial processes and reduce industrial demand for clean water • Share results of industrial wastewater recycling with various local & state institutions and repeat project in industrial parks on both sides of Mexico-USA border
Identify priority waste streams and develop sustainable materials management and circular economy practices that strengthen their respective market value	• Problematic waste stream crossing the border is toxic chemicals that could be recycled and are now causing serious health & environmental problems • Management issues with wastewater sludge leads to re-pollution of beaches & rivers in heavy rains	• Eliminate waste stream from crossing border at Tijuana and New River drainages through piping of all wastewater to desert from pipeline • Eliminate toxics from entering waste stream by working with industrial parks on chemical and water recycling • Improve management of wastewater sludge which is now highly toxic and put in storage facilities that leak and eventually have wastewater sludge that has no chemicals and can be re-used in non-food agricultural production that will lower Co2 emissions of biofuel

Project Benefits: JOBS in Mexico & USA

10,000+ jobs likely from the following activities:

1) Planting of agave/potatoes on 4300 ha./year in Mexico & 2000 ha./yr. in CA ongoing total project period
2) Harvesting 6300 hectares of agave each year in USA & Mexico starting in year 5, 5000 ha. potatoes year 1-5
3) Transportation and processing of 4.3 -15 million tons of agave per year at sugar plant, 500,000 MT potatoes
4) Extraction of 860K to 3 million tons of sugar with all sugar used for ethanol production
5) Operation of three ethanol plants with combined capacity of 156-538 million gallons (1 in US, 2 in MX)
6) New plants in Tijuana to produce composites due to fiber and bio-material availability
7) Increased auto and auto parts manufacturing as a result of combination of composites & electronics parts with strong demand due to recycling & natural content regulations in the EU
8) Other electronics and consumer products production because of composites available
9) Improved yieds on agriculture will make Mexican and USA crops more competitive globally
10) Baja California & Imperial Valley will be innovation center in agriculture, medicine & manufacturing
11) Increased tourism because of elimination of water & air pollution and interest in green industries
12) Increased land values from improved water quality, water availability & tourism
13) Additional jobs in Sonora if 25,000 ha. agave/potato project developed (could add another 5-6000 jobs)
14) Other job opportunities if there is expanded planting of Agave in USA and Mexico in future

Project Benefits: IMMIGRATION

Job Camps at Agave Growing Areas to Train Immigrants in Best Ag Practices

Planting of agave in large areas of desert along the USA-Mexico border offers opportunities to look at creative solutions to the immigration problem. The concept is to set up job camps at the border and house and train immigrants on best agricultural practices while they are waiting for immigration clearance instead of being locked up in US detention centers

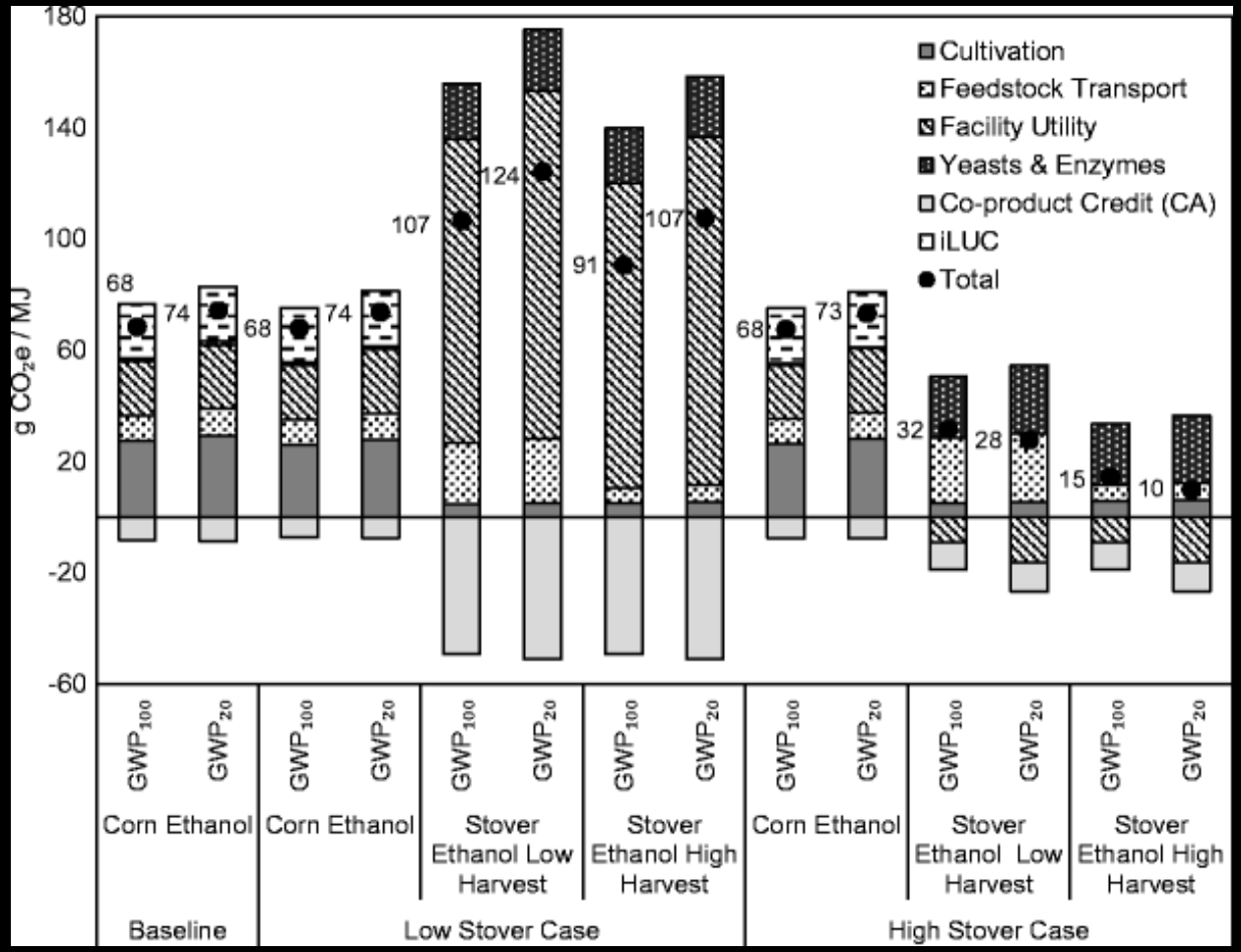
GCarbon CalMexar will team up with Mexican & US border patrol agencies and non-profit church groups now handling immigrant flows and set up camps that meet basic requirements for safe housing, food, water and waste management. This could be 1/3rd of the cost of taking in immigrants and housing them in detention centers where no training occurs. Immigrants will be given jobs on both sides of border so they are trained in agricultural work & gain income from work.

Immigrants will participate in a program to introduce them to various agricultural techniques for irrigation, yield enhancement, soil additives, disease control, planting and harvest techniques that can increase crop yields, lower disease levels and enhance production efficiency. This knowledge will then filter to the US agricultural industry as some of the immigrants are granted permission to work in agricultural fields in the USA. English will also be taught so they can pass tests required for anyone wanting to become a US Citizen and improve their chances of getting jobs in USA or Mexico

Immigrants that are unable to cross the border are at the same time learning valuable agricultural skills that can be applied to enhance the productivity and efficiency of the Mexican and California agricultural sector. These same trained workers will be of high value to Mexican, Californian and Arizona farms wanting access to both new technology to increase yields and workers familiar with how to apply the technology to typical farms in Mexico or USA. People learning English will be valuable workers in whatever jobs they end up in.

Why $Co2_e$ of Ethanol Matters = 2x Price for fuel, 2-3x Profits

(subsidy of $1.80/gal. if reach 100% Co2 goal= more revenue than ethanol value)



- ✓ Very High yields = low cultivation emissions
  Low nitrogen use = low cultivation emissions
- ✓ High yields = feedstock can grow next to plant
  Feedstock at plant = very low transport Co2
- ✓ Solar for Steam = low facility utility emissions
- ✓ Yeast & Enzymes = none needed for agave ethanol
- ✓ Co Product Credit = very high value of fibers
- ✓ ILUC/LUC = zero ILUC or land use change
  ILUC/LUC = very high yield = little land needed

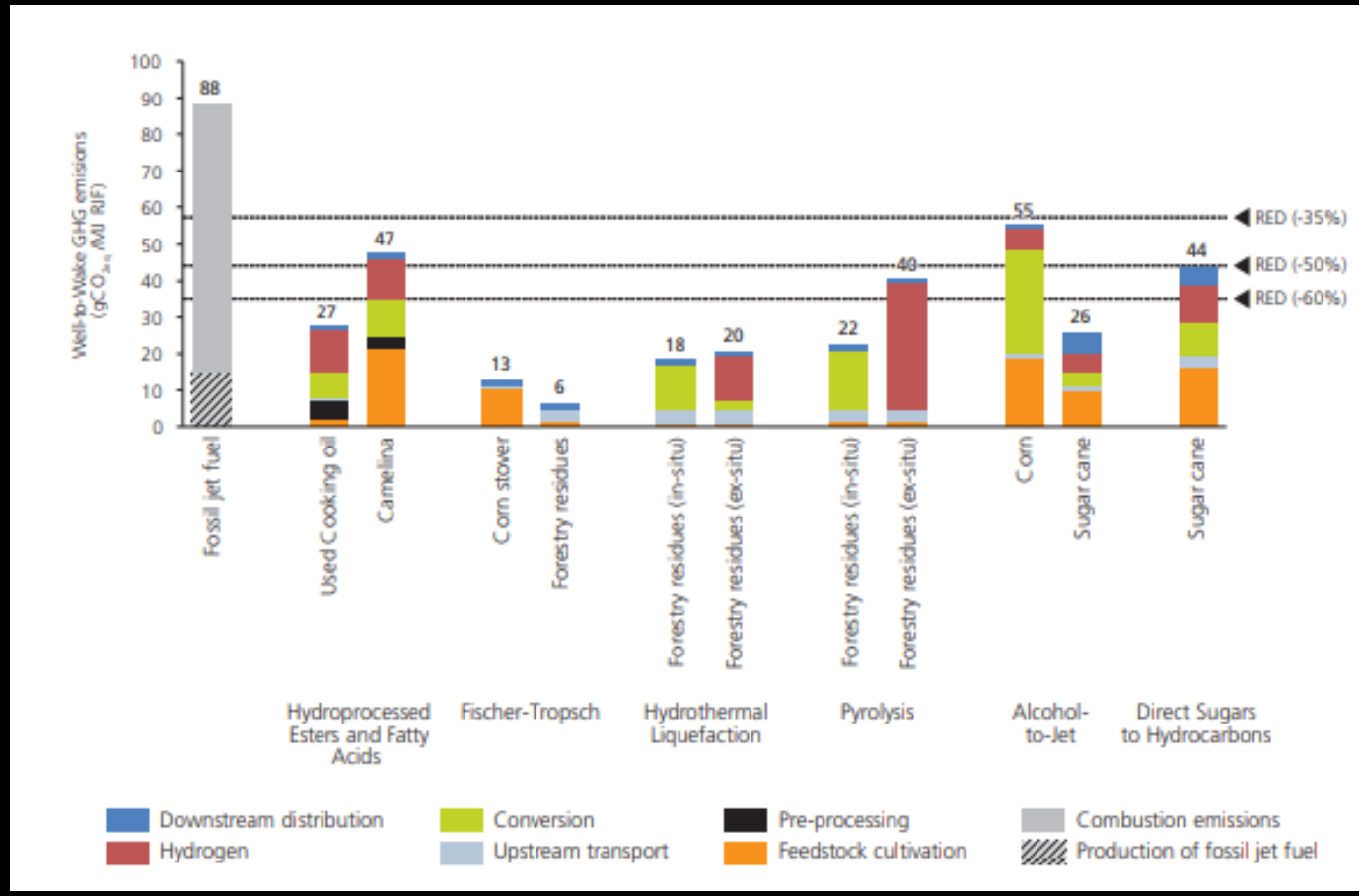
Ethanol Fuel Value = $1.38 Rin Credits = $0 Ship to CA = $0.12 Fuel Sale Price $1.50
Carbon Fuel Standard (LCFS) Credit = $1.80 at 100% reduction ($1.70 at 95 %)

If $3.30 LCFS + fuel Value is double value ethanol only

Life Cycle Co2e of Agave Ethanol Will be Very Low

(corn at 30%, sugar at 60%, S. Agave at 10X better than sugar means great results)

- According to CARB, corn ethanol Co2 life cycle benefits are 30% and cane benefits are 60% (cane uses bagasse to generate steam for conversion instead of nat. gas)
- Agave ethanol is 10 times better than ethanol yield of cane and 20x better yield than corn with large volume fibers for use in composites and feed
- For agave ethanol to achieve super high carbon benefits beyond high yield, feedstock for steam will be solar and co-allocation of emissions to fibers and composites will need to include sequestering
- The long grow cycle of agave (5 years) means large amounts of Co2 are sequestered in the plant and provide permanent sequestration in fibers and soil. We can use this value to promote a carbon reduction of greater than 100% and carbon credits for sequestering Co2 in fibers and soil of agave.

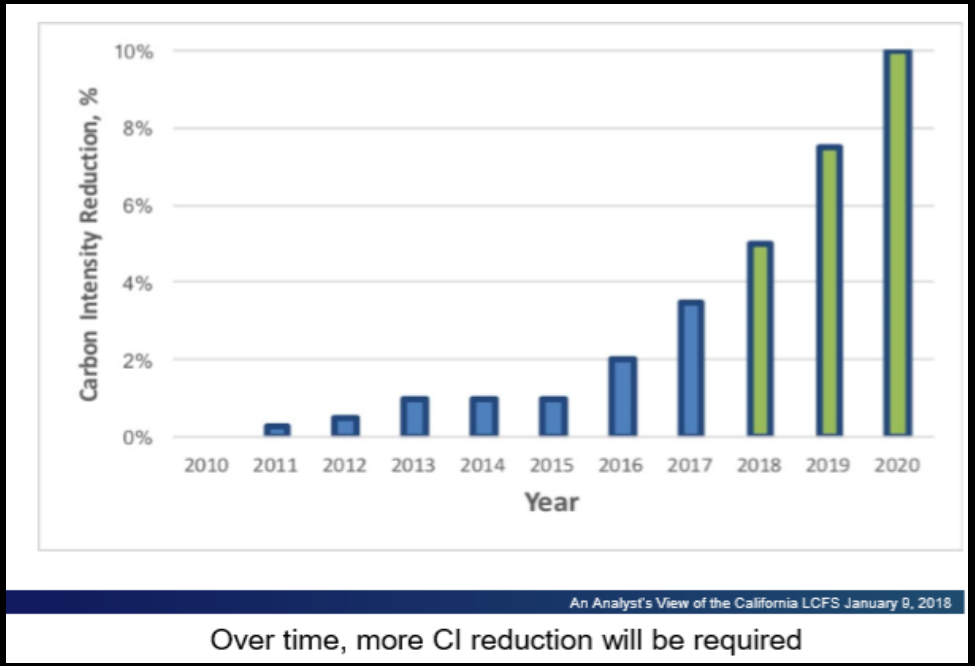


Source: Utrecht University Report to EU

CA Market =LCFS with -75%-100% Co2 = $1.3-1.6/gal.

High Co2 benefits (-100%) = big market in California, WA, OR, BC

- Low Carbon Fuel Standard is in place in CA, OR, WA & BC. It requires that carbon intensity of fuel be reduced by 20%. This requires fuel distributors to buy fuels with low carbon emissions or purchase LCFS credits from other distributors.
- California is way behind in achieving even 10% carbon intensity reductions so distributors are having to pay a lot more for LCFS credits to meet requirements.
- The demand and value of LCFS credits will grow as there are not many fuels that can be blended in gasoline with 75% Co2 reductions. This means a decade of strong demand for ethanol that meets these requirements.
- USA GO3Carbon ethanol will be sold in CA for LCFS $
- CA, WA, OR & BC will require billions of gallons fuel
- Min -95% Co2 benefit = very large market for ethanol
- Market value of fuel is double & profits are very high



Over time, more CI reduction will be required

Project Benefits: INCOME & GROWTH

INCOME

Value of Ethanol up to $1.6 Billion USD & Composites $440 mil

1. Fuel value of MX ethanol $1.50 gallon * 157-538 million gallons = $236-807 million USD
2. Carbon value of agave ethanol @ -100% CO2 = $1.8/gallon = $283 mil. to $968 million USD
3. Combined value of ethanol and Low Carbon Fuel Standard Credits = $519 mil. to $1.78 bil.
4. 1.2 to 4.4 million tons of fibers a year with value in composites of at least $120-$440 mil

GROWTH

Project can be duplicated in all large cities where there is wastewater for irrigation, rivers or at least 600 mm of rainfall

SONORA, SINALOA, JALISCO, MEXICO CITY, GUADALAJARA, OTHERS

Project Benefits: WATER POLLUTION & CLIMATE CHANGE

WATER POLLUTION

200 Million gal/day of water polluting California is instead recycled for pototo/agave ethanol

1) Daily discharge of raw sewage in California will stop because all wastewater will be used

2) Chemical and industrial wastewater recycling will save industry $$ and avoid very serious pollution problems from illegal chemical wastewater dumping

3) Companies gain substantial sustainability advantages from water & heavy metal recycling

4) Reuse of water will reduce demand for fresh water and help avoid problems from water shortages

CLIMATE CHANGE

Displace 150 Mil.to 1 billion Gallons Petroleum, Leads to 0.8%-5.8% Lower Transport Co2 in CA

1) 150-538 million gallons @ 20 pounds Co2 per gallon = 1.36-4.89 million MT Co2 avoided/year
2) Co2 reductions doubled if 30% ethanol mixed with 70% water= 2.7-9.8 million MT Co2 avoided/year
3) CA CO2e emissions in 2018 425 million MT, transport 40% =170 million MT CO2, -1.6%-5.8% if all ethanol is mixed with 70% water, half this impact if ethanol only (-0.8% to 2.9%)
4) Sequestration of 200-700 MT/ha./year* 29,552 ha.= 13.3 mil. MT in plants/year (temporary)
5) Soil sequestration of 60-80 MT per ha. per year x 29,552 ha. = 2.1 million MT carbon (permanent)
6) 30% of biomass in plants sequestered in composites = 4.0 million MT/yr. (permanent)

Using GCarbon Connection to Consumer & Retailers

Enthusiasm About Products due to Quality & Carbon Benefits

- GCarbon & Go3 Carbon are in parallel developing direct to consumer outreach using the Carbon Neutral Card, GO3 Carbon Coin, carbon neutral fuels, forest preservation and new climate tech promotion.

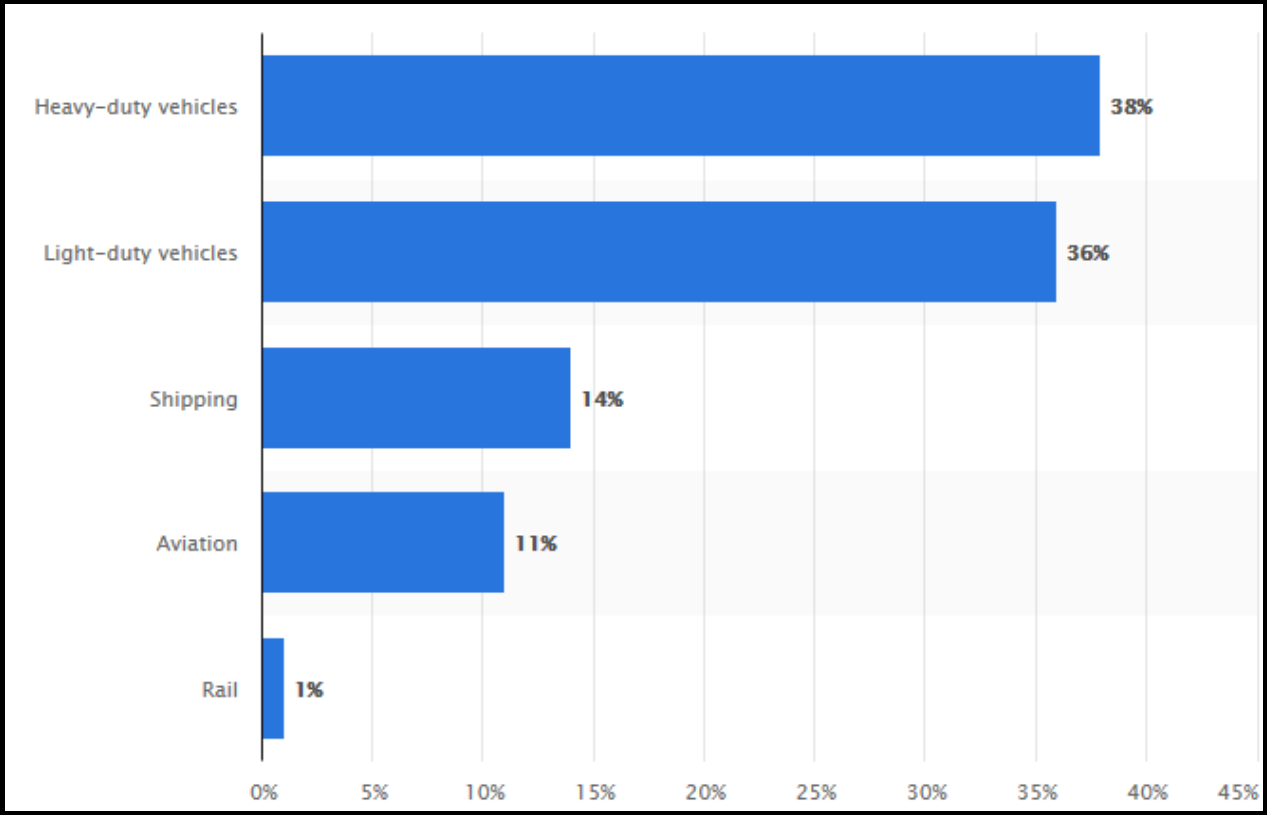
- We will be selling carbon neutral gasoline & diesel to retail fuel stations that offers a window for working with convenience stores to interface with the consumer & promote product line

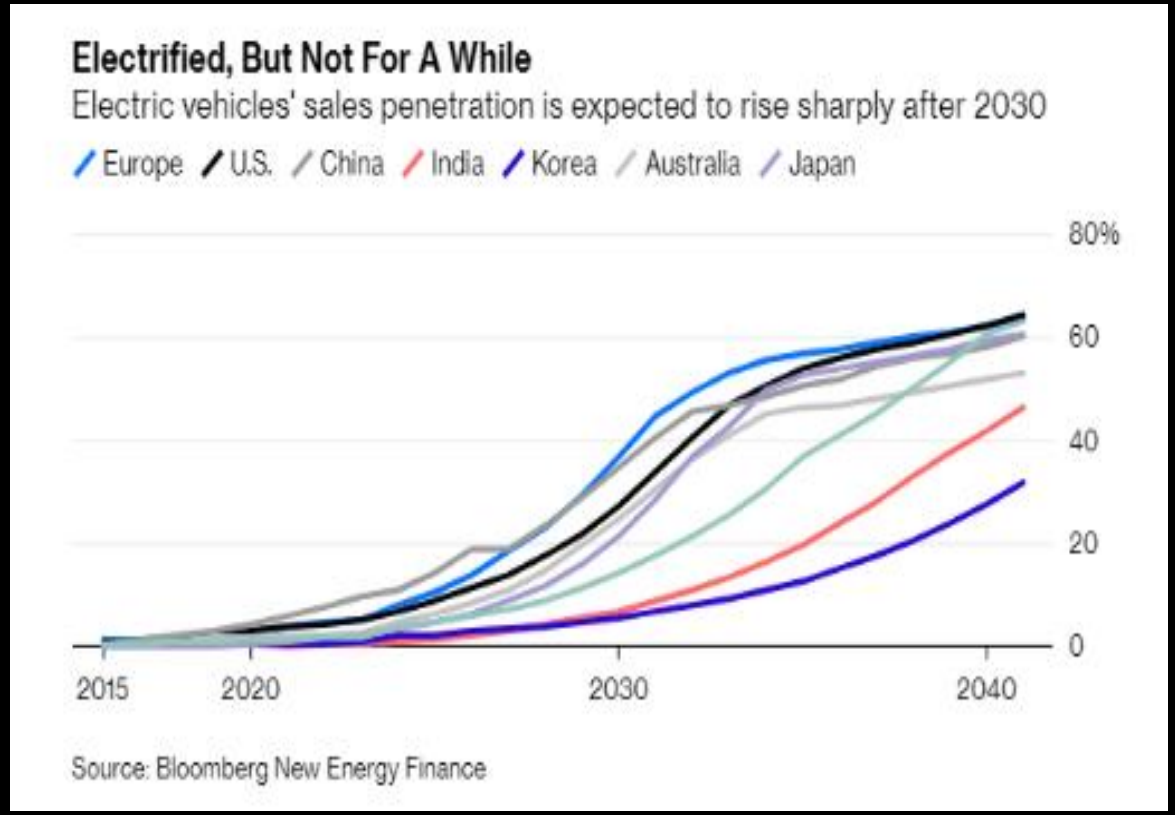
- GCarbon is setting up distributors in each major US city that will be promoting GCarbon programs and products through a warehouse, cooking, restaurant & food delivery system

- We will have an app for smart phones to educate consumer about climate change, carbon neutral buying options, benefits of preserving rainforests and planting trees and new approaches to producing food and biofuel that offer options for low carbon living. This will help build a strong consumer base to generate enthusiasm about product line at all points of sale (supermarket, convenience store, restaurant, home delivery, etc.). We will use this strategy to get beef, pork, cashew nuts, fish and other products in stores and restaurants.

Light Duty Vehicles = 36% of 2050 Co2 Transport Emissions

EV's are good but will take time, alternative is higher ethanol use with 85%-100% Co2 benefits





Co2 emissions from light duty vehicles in 2050 are 36% of emissions. EV's will gain a 60% market share by 2040 in new car fleets in USA and some other countries. Used car fleet will be on the road for another 10-20 years after that. Any solution in the next 30 years to Co2 in light duty fleets requires rethinking how to get low Co2 fuels in gasoline or diesel Sweet Potato and agave ethanol are answers because they provide 70-100% Co2 reduction and requires very little land (400,000 ha.) to achieve 25% ethanol in all West Coast US gasoline. Mixing ethanol with water allows us to address CO2 emissions from truck and delivery fleets which are harder to electrify due to high capital cost & range concerns.

GCarbon Goal = 30% ethanol with -85-100% Co2 by 2030

High Co2 benefits (-100%) & high yield/low land use means 30% Co2 possible in USA by 2030

Brazil already requires up to 27% ethanol in all gasoline and 90% of new cars are flex fuel as a result of different taxes on new cars. Drivers switch from ethanol to gasoline depending on cost (if price is 20-30% lower people buy ethanol)

The main opportunity in US fuel market is that there is now a West Coast LCFS program to reduce the Carbon Intensity of gasoline & diesel by 20% by 2030. A national program in the USA is possible given the new climate agenda in White House.

Fuel suppliers must meet mandatory carbon reduction requirements of pay fines or fees. Producers will be given carbon credits based on the life cycle carbon reductions from their fuel pathway. These credits will be purchased by fuel suppliers if they are unable to meet the carbon reduction requirements with biofuel.

New engine technology (ethanol only) could increase demand for ethanol in new cars by eliminating the fuel efficiency penalty. Water-ethanol mixtures could double fuel economy and create large Co2 reductions and fuel savings for consumers

CA, WA, OR & BC has LCFS that requires 20% Carbon Intensity reduction of fuel by 2030

Biofuel Producers get LCFS credits based on CO2 benefits of fuel

Share of ethanol in gasoline could increase from 10% to 30% by 2030 if there is super low Co2 ethanol

Tens of billions of gallons of ethanol could be future market

Mexico & CA - THINK BIG

Agave= 160 to 700 MT/ha./yr.
2 to 10x ethanol vs. cane + 30% fibers

Fibers for composites

High Yield Sweet Potatoes for ethanol & feed for animals

Calliandra = 25 MT Co2/yr
Plus wood chips, honey, feed

Use Your Wastewater Wisely Stop Illegal Chemical Dumping Create Billions of Gal. Ethanol

- High Productivity Use of Desert and Ag. Land and Integrated Fiber, Feed & Fuel Complexes to provide jobs
- Stop chemical dumping by setting up water & chemical recycling and improve wastewater plants
- Move treated wastewater to fields to produce food & biofuels instead of polluting the rivers and oceans
- Look at feedstock options such as sweet potatoes and calliandra to improve agriculture in various Mexico states

Project Management:

Study Stage:
Non Profit Organization & USEPA for Oversight
Project Development Team

Build Out & Planting Stage:
Non Profit Organization for Oversight
Project Design Team
Construction Company or Companies
Agricultural Project Management

Governance Issue: Controlling Spending Study Phase

We will discuss various options with EPA for oversight & project management so funds spent right

- Governance and management of funds is a key issue to enhance interest in a Mexico option for cleaning up wastewater. US EPA will be identifying how best to manage funds in Mexico or USA. The strength of the governance plan will affect interest in funding Mexico projects.

- The proposed plan at the study stage is to work with a non profit group that is passionate about cleaning up the wastewater problem and has offices or sister NGO's in the USA and Mexico. We will team up with them and have them manage the spending in the study phase.

- GO3 Carbon CalMexar will be established as a special purpose company to bring together project partners and will establish a corporate presence in both the USA and Mexico. This will allow us to work the project tin both countries and deal with restrictions of only Mexican companies receiving funds for projects built in Mexico.

- The non-profit will receive funds and be responsible for making sure we meet specific goals in the study phase and that there is a clear public benefit from the study once it is completed. One goal in study phase is to get agreement on a governance plan for spending in the construction phase so project gets done in a manner consistent with EPA guidelines

FUNDING SOURCES

US EPA | N.A.D. Bank | Other Sources

OVERSIGHT

Non Profit USA | US EPA | Non Profit Mexico

STUDY COMPLETION BY PROJECT TEAM

GCALMEXAR USA | GCALMEXAR Mexico

DISSEMINATION

NON PROFITS | GOVT. AGENCIES | PROJECT TEAM

Governance Issue: Control Spending Build Out Phase

Study phase will sort out both design issues, final costs, governance options,

- Governance and management of funds becomes more critical in the construction phase. The idea of the study phase is to make specific recommendations that will lead to a manageable project in the construction phase and then implement these options when building.

- US EPA should take a pro-active role in oversight since it is US funding and a top tier discussion between US Government and Mexican government will help the project stay on track. Non-profit could potentially help in either direct control of funds at project level or by providing 3rd party confirmation of progress made by construction companies.

- GO3 Carbon CalMexar is very interested in the final results being achieved and in making sure the equipment is put in right so it would want to play a role in design and construction oversight.

- To make sure the facilities are operated correctly and that industrial recycling is occurring, waste is treated to various biological system requirements and the wastewater is allocated according to plan it may be necessary to form public-private partnerships or other structures.

FUNDING SOURCES

US EPA | N.A.D. Bank | Private Investors

OVERSIGHT

Non Profit USA | US EPA | Non Profit Mexico

BUILD OUT TEAM

GCALMEXAR DESIGN CONSULTANT | MAJOR USA & MEXICO CONSTRUCTION CO.

OPERATION

GOVT. AGENCIES | PUBLIC-PRIVATE PARTNERSHIPS | PROJECT TEAM

Governance Issue: Top Down Control, President Level

To insure project is built right key is to get Mexico & USA Presidents to endorse/commit to project plan

The proposed project covers a broad range of issues and is important at the highest levels of government because of its impact on job growth, immigration, water & wastewater problems and climate change. The idea is to get senior Cabinet members in both governments to commit to implementing the project after the study phase and to put pressure from the top down to make sure the project gets completed.

To achieve this goal the idea is to get interest in the study from political leaders even before the study is initiated that will then make sure the results reach the Presidents and they delegate the oversight to the appropriate agencies in each government.

One key way we can assist in this effort is to disseminate results after the study is completed and during and after the construction phase that allows government, industry and the public to understand benefits

The public awareness phase can occur once there is buy-in from the government and industry about the project plan. This could occur at the study phase or could wait until project start or completion. Once the public understands the benefits it can overcome any barriers that may be put up from various directions.

TOP DOWN OVERSIGHT

- USA PRESIDENT
- MEXICO PRESIDENT

ON THE GROUND OVERSIGHT

- CLIMATE CZAR
- US EPA
- MEX CABINET PERSON

LOCAL SUPPORT FOR PROJECT

- NON PROFIT ADVOCACY
- GCARBON OUTREACH TO INDUSTRY

PUBLIC AWARENESS

- NON PROFITS
- MAJOR MEDIA OUTLETS
- SOCIAL MEDIA

GCarbon & GO3 Carbon Project History & Activities

GCarbon & GO3 Carbon have various initiatives involving sustainability that offer an integrated approach to new tech. & waste utilization

GCarbon Brazil

GCarbon CalMexar

GCarbon USA

	INVESTMENT FOCUS	REVENUE STREAMS
GCarbon Brazil	Ethanol & Biodiesel Hogs & Pork Processing Fish Production	Fuel Sales & CBIO Meat Sales Fish & Other Sales
GCarbon CalMexar	Waste Plant Tech. Irrigation with Wastewater Agave Production	LCFS Fuel Sales JV Revenue Streams Retail & Consumer Distribution
GCarbon USA	GO3 Carbon Card Next Gen. Energy Co2 Neutral Fuel Forest Protection	GO3 Carbon Card & Coin & Fuel Sales Co2 credtis Virus Protection

Our Core Biofuel & Feedstock Expertise

- Bill Wason has been involved in US and global biodiesel/biofuel and veg. oil industry since 2002 and has helped build or design biodiesel and oil crush plants in USA, Poland and Canada. Mr. Wason also has extensive experience in sourcing & bidding for purchase of fuels and use of biofuel to meet regulations.
  - Bill Wason has extensive connections with government & academia to gain support for plan
  - Bill Wason has prior experience in running biofuel plants and designing large biofuel projects
  - Bill Wason is a recognized thought leader in collection, purchase and processing of vegetable oils, UCO & Yellow Grease and all requirements for conversion to biodiesel, renewable diesel or jet fuel
  - Bill Wason is an expert in how to plant, process and co-feed various feedstocks into an ethanol, biodiesel or jet fuel plants. He helped a national coop in Brazil with evaluation of various new crops to improve farm income in semi arid and tropical climates. Options evaluated were sisal, agave, beans, macauba and sweet potatoes. This led to 6.3 million USD in funding for pilot projects.
  - Mr. Wason worked with the agronomist who introduced camelina to North America on the designing and finance package for a 1 million MT canola-camelina crush plant in Saskatchewan, Canada
  - Mr Wason is familiar with both oil and ethanol pathways to make jet fuel, having designed and promoted the financing of two 100 million gallon renewable jet fuel plants in Houston, TX and Ferndale, WA and having assisted Ausagve & Byogy with introduction of their technology to Brazil.
  - Other biofuel expertise included building a 10 million gallon biodiesel plant in California and designing a 75 million gallon/yr. plant in Poland.

- Agave Farm in Sonora has been breeding blue agave species for the last 10 years and has achieved good yields vs. other agave production effort. We are also working with a technology supplier outside of Mexico that has very high yield agave species and will support species introduction to Baja & Sonora

Our Core Water & Wastewater Expertise

- Lorenzo Payan has significant experience in managing large companies and hundreds of employees. He has been a leader in Baja and Western Mexico in developing innovative water & wastewater systems and new agricultural, medical and industrial technology.

- Lorenzo Payan has biochemical engineering background with degree from Monterey MIT and is an 35 year expert in water treatment, sanitation, waste management, animal and fish production & processing and new technology to control disease in agriculture using ozone, UV and other technologies.

- Lorenzo Payan has a long list of satisfied customers that have had water or wastewater systems set up or ozone put in for various water treatment or building applications. This is a short list of some of the facilities:
  - Mitsubishi water system for Isla de Cedros, 1992 1000 liters per second, working flawlessly since
  - Tecate Breweries: 3 different facilities, to treat water for beer production, all systems functioning
  - Las Palmas Hotel: Feb. 2003, 5 star hotel, ozone treatment of large Olympic sized pool, impecabble performance
  - Shrimp Plant; 2004, Tepic Nayarit shrimp plant, ozone for water for cleaning, in bags prior to freezing
  - 38 Years, Perfect Record: Lorenzo Payan has a perfect record for installing systems that work, keep on working

THANKS FOR YOU ATTENTION, IF HAVE QUESTIONS

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