



# **Community Scale Low Impact Pumped Hydroelectric Storage**

**NECPUC Shark Tank Presentation**

**June 2019**

# The team

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## Denis Payre

- Serial entrepreneur for the past 30 years
- Co-Founder and COO of software company *Business Objects* for 7 years. First customer was EDF. Deployed in 50+ countries and most successful listing on Nasdaq in 1994. Now global division of SAP.
- Co-Founder and President of e-logistic company *Kiala*. Network of 7,000 collection points throughout Europe. Customers included Amazon. Now global division of UPS.
- Launched Nature and People First in 2015. First projects in the French Caribbean with EDF

## Peter Wallis

- Energy Project Development expert with over 30 years of experience in the industry including hydro
- Areas of expertise:
  - VP Strategic Development, *Ameresco* 13 years
  - *New England Electric System* (now *National Grid*) 4 years
  - Harvard MBA

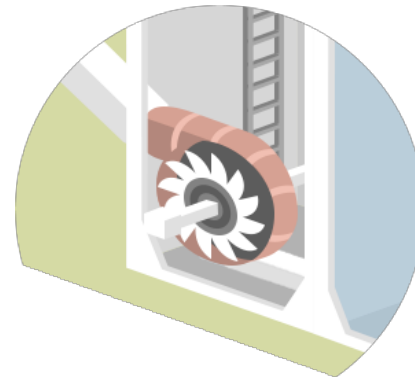


- US – French Infrastructure fund with \$6 Billion under management
- Funding agreed for three projects in the French islands (development and equity)

# Community Scale Low Impact PHS

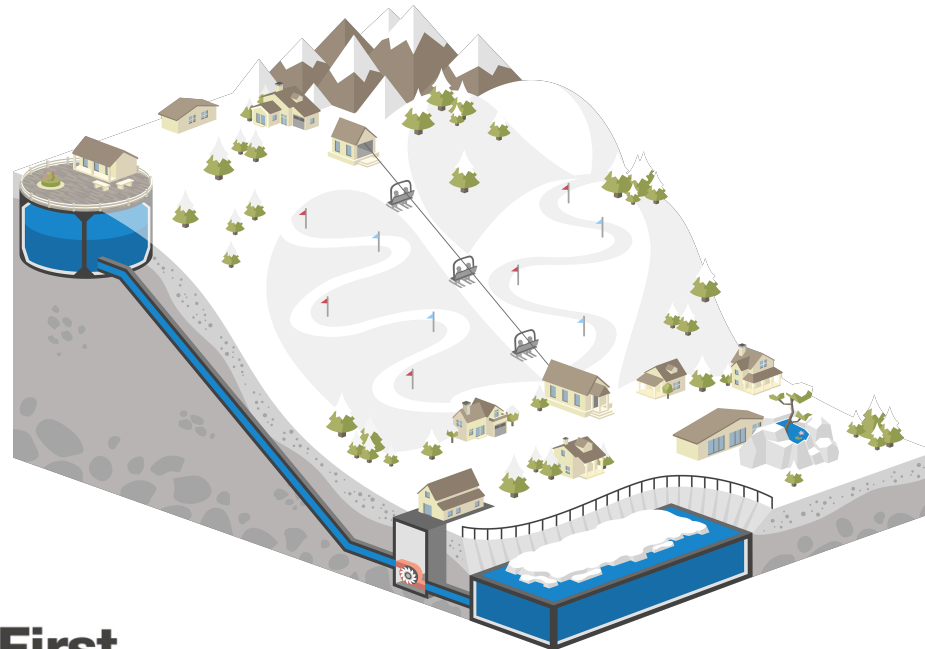
- Based on well proven PHS technology. From 700 feet Vertical and 1 acre of land.
- Comparable to battery costs with PPA's over 30 years
- Three main differences with traditional PHS in order to obtain permitting and fund these projects fast:
  - 1/ Small sizes (3 to 15 MW):
    - Limits Capital expenditures and risks.
    - Less invasive, less land required means less hostility: the size of snow making ponds in ski areas – 40 acres feet on average.
    - Close to consumption sites, low connection costs to the grid.
    - Off the shelf equipment (pumps, turbines, penstocks..) and based on standard construction techniques
  - 2/ Closed loop. No impact on river systems.

3 MW to  
15 MW / plant



# Community Scale Low Impact PHS

- Three main differences with traditional PHS in order to ease acceptance, deploy and fund these projects fast (cont'd):
  - 3/ Multi-use to ease acceptance and lower costs:
    - Floating solar panels
    - Combine reservoirs, at least partially, with useful objects (new or renovated) : technical building of PHS, lodge, parking lots, sports fields, warehouses, roads, highways. In rural area, no need to integrate both reservoirs.
    - Combine with additional services such as fire prevention, snow making, heat and cold generation with heat pumps, irrigation, wind turbines...





# Community scale/ Low Impact PHS makes sense in Ski Areas

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- **Potential of 1 GW in ski areas in New England**
- **One entity controls the land from top to bottom**
- **Mountains, top and bottom have already been built out, simplifying permitting.**
- **Accustomed to building ponds and permitting ponds. Possible synergies between PHS ponds and snow making ponds**
- **High need for energy for snow making. Existing powerful substations.**
- **Location at the end of distribution networks makes them sensitive to stability and resilience.**
- **Management is usually sensitive to global warming. Green image opportunity, need to attract millennials**
- **Interest in diversifying revenues because of impact of global warming on their business.**

# Regulator concerns

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- Cost:
  - 4 hour comparable to batteries
  - Additional hours @ 20% of battery cost
  - Lower financing costs (interest rate, debt to equity ratio, duration)
- Superior Performance:
  - No degradation over time
  - Multiple dispatches per day, every day
  - 100% dispatch does not affect life
  - Utility grade asset - 50+ year life
- Easily Expandable as Utility System Needs Change
- No Environmental and Ethical challenge:
  - No Mining of battery with chemicals and water usage in deserts
  - No Disposal of toxic wastes like for batteries.
  - Kids working in Cobalt mines and low security causing deaths and diseases
- Lower Risk:
  - Won't burst into flames
  - Concentration of countries controlling key battery materials: New Opec?
  - Makes sense to diversify technologies : have a balanced mix
- Better political acceptance:
  - More local jobs – Accessible jobs
  - No reliance on foreign countries/ Contribution to National Security
- **These benefits are not taken into account today when benchmarked with batteries: large savings, long life, no degradation, all American**

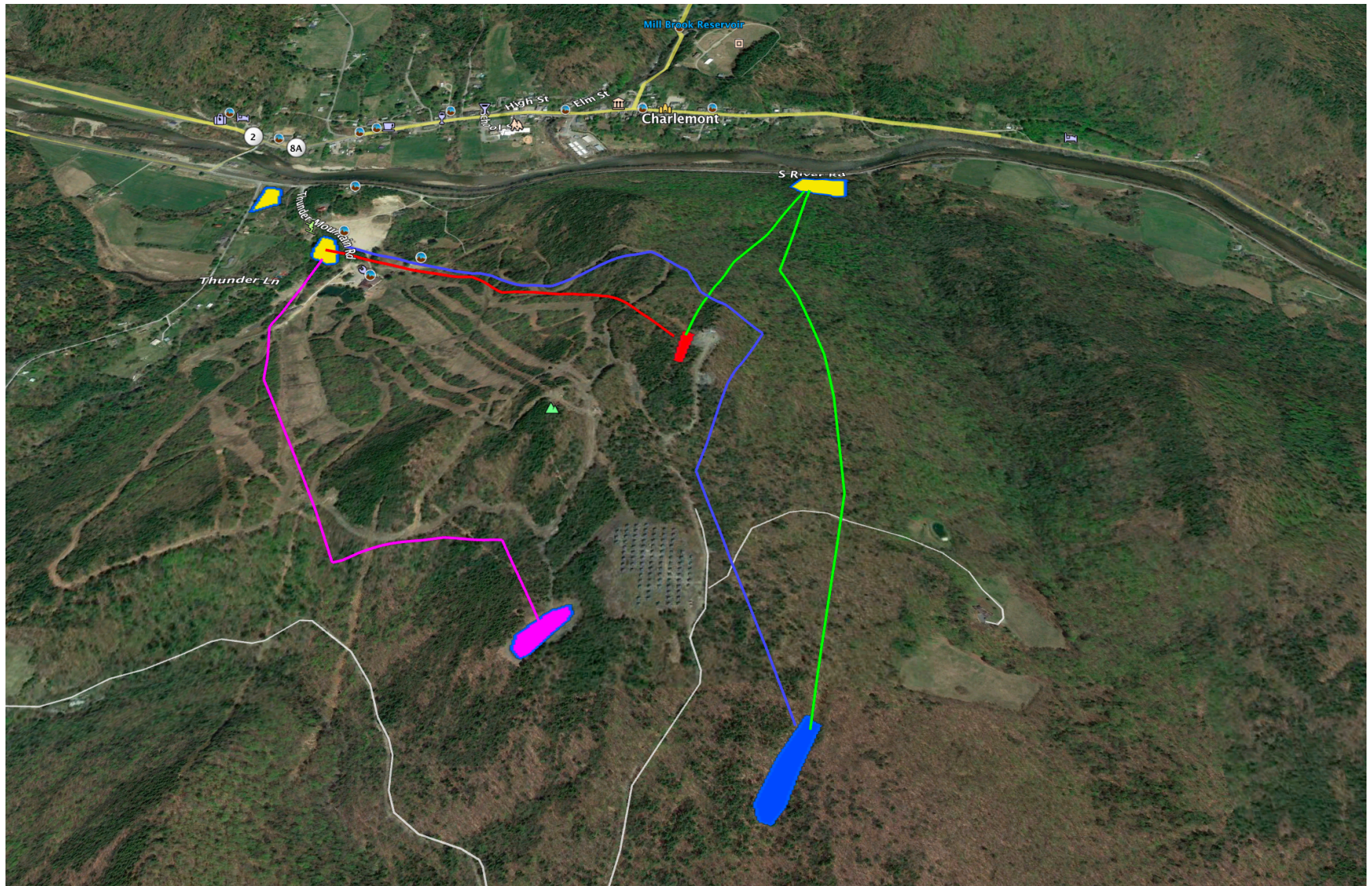
## ■ More Than 150 Evacuated From Stuck Chairlift at Ski Resort<sup>A</sup>

Vermont ski resort says more than 150 skiers and snowboarders were evacuated off a chairlift that stopped.

- Jan. 28, 2019, at 5:18 p.m
- **STOWE, VT. (AP)** — STATE regulators are looking into why a chairlift stopped running at a [Vermont](#) ski resort, prompting the evacuation of approximately 160 skiers and snowboarders. The Lookout Double lift stopped operating around 10:30 a.m. Sunday because of an interruption in the electrical system, Stowe Mountain Resort spokesman Jeff Wise said in a written statement. An auxiliary engine also did not work so the ski patrol started evacuating the lift at 10:45 a.m. using rope to rappel people down. All guests were safely off the lift by about 1 p.m., Wise said. Two people were treated for minor cold-related issues, he said. Some were stranded for hours. Keri Crafts, of Burlington, and her two daughters were about halfway up when the lift stopped. She told WCAX-TV they sat there for about 2 ½ hours, and at one point, she saw people start to jump from chairs to the ground.



# Possible implementation in a ski area in New England





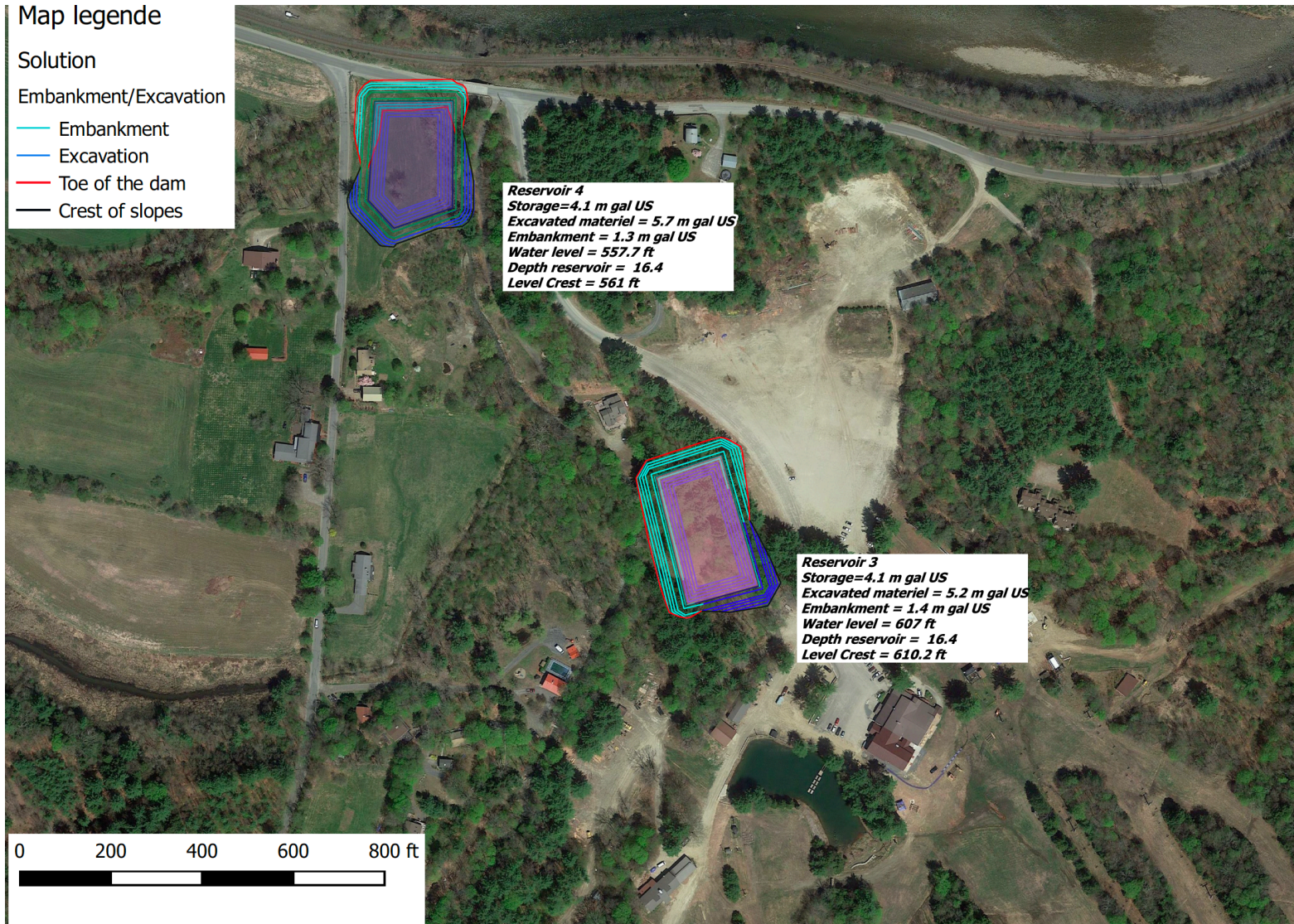
# Potential lower reservoirs

## Map legende

### Solution

### Embankment/Excavation

- Embankment
- Excavation
- Toe of the dam
- Crest of slopes





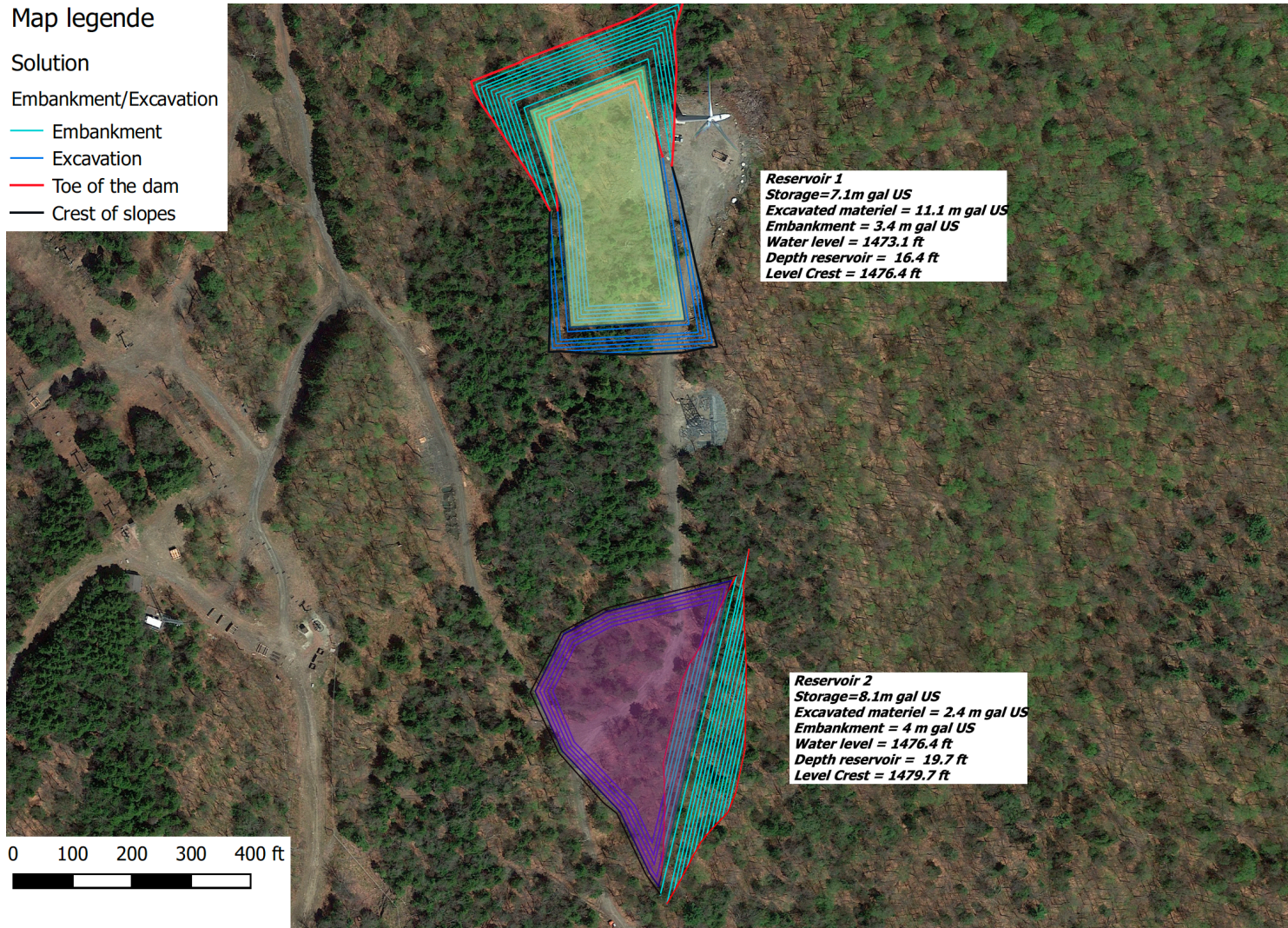
# Potential upper reservoirs

## Map legend

### Solution

#### Embankment/Excavation

- Embankment
- Excavation
- Toe of the dam
- Crest of slopes



**Reservoir 1**  
Storage=7.1m gal US  
Excavated materiel = 11.1 m gal US  
Embankment = 3.4 m gal US  
Water level = 1473.1 ft  
Depth reservoir = 16.4 ft  
Level Crest = 1476.4 ft

**Reservoir 2**  
Storage=8.1m gal US  
Excavated materiel = 2.4 m gal US  
Embankment = 4 m gal US  
Water level = 1476.4 ft  
Depth reservoir = 19.7 ft  
Level Crest = 1479.7 ft

0 100 200 300 400 ft

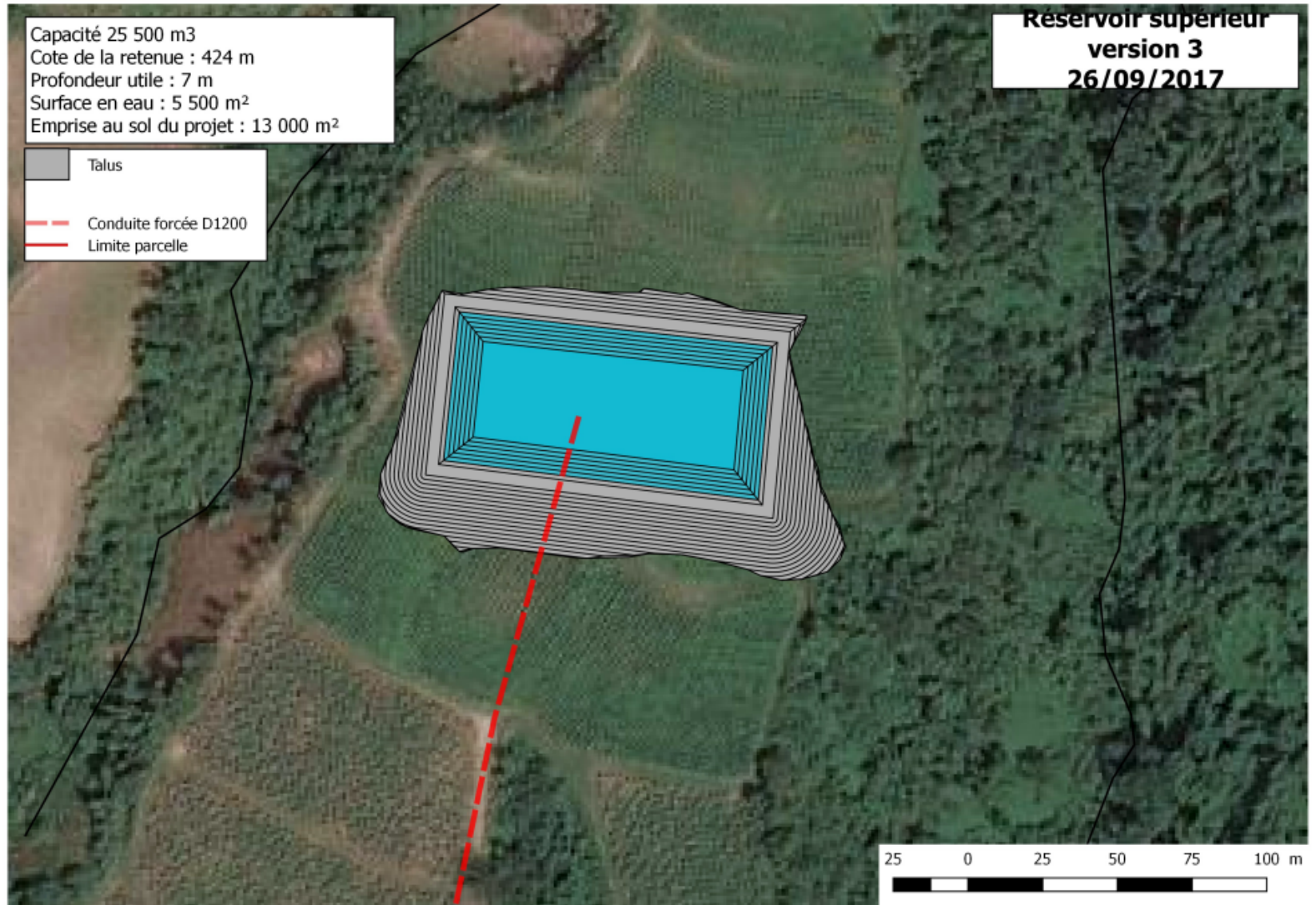




MARTINIQUE – SAINT PIERRE PROJECT  
Overall map of the site

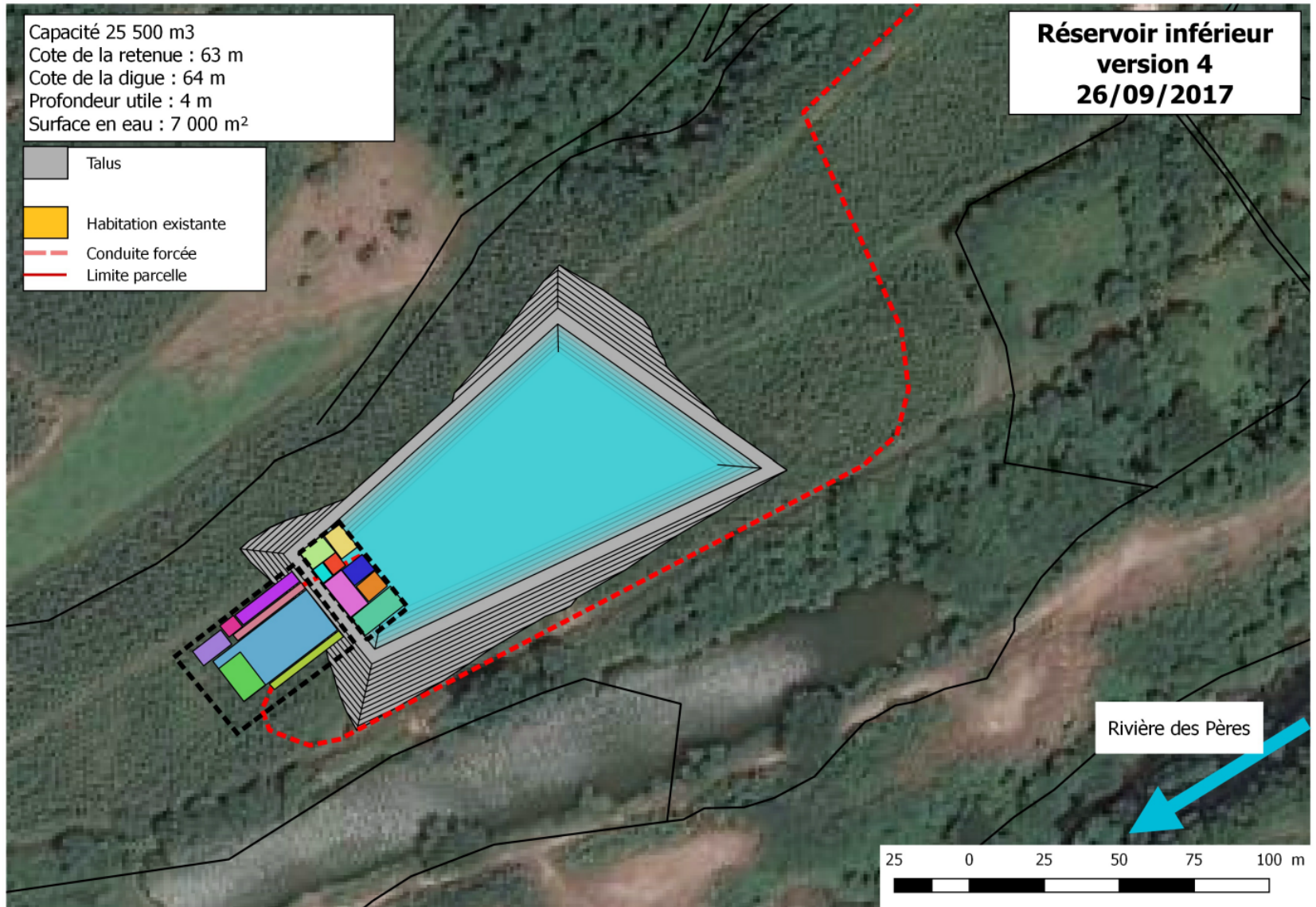


# View of the upper reservoir





# View of the lower reservoir and production plant



# Main features of Saint Pierre site

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<b>Elevation</b>	360 meters or 1,180 feet
<b>Upper reservoir</b>	Man made pond
<b>Lower reservoir</b>	Man made pond partly covered with agriculture warehouse and by part of technical buildings for PHS plant
<b>Length of penstock</b>	2,500 meters or 8,200 feet
<b>Volume of reservoirs and footprint</b>	25,500 cubic meters of water and 5 acres per reservoir