

Look Before You Leap

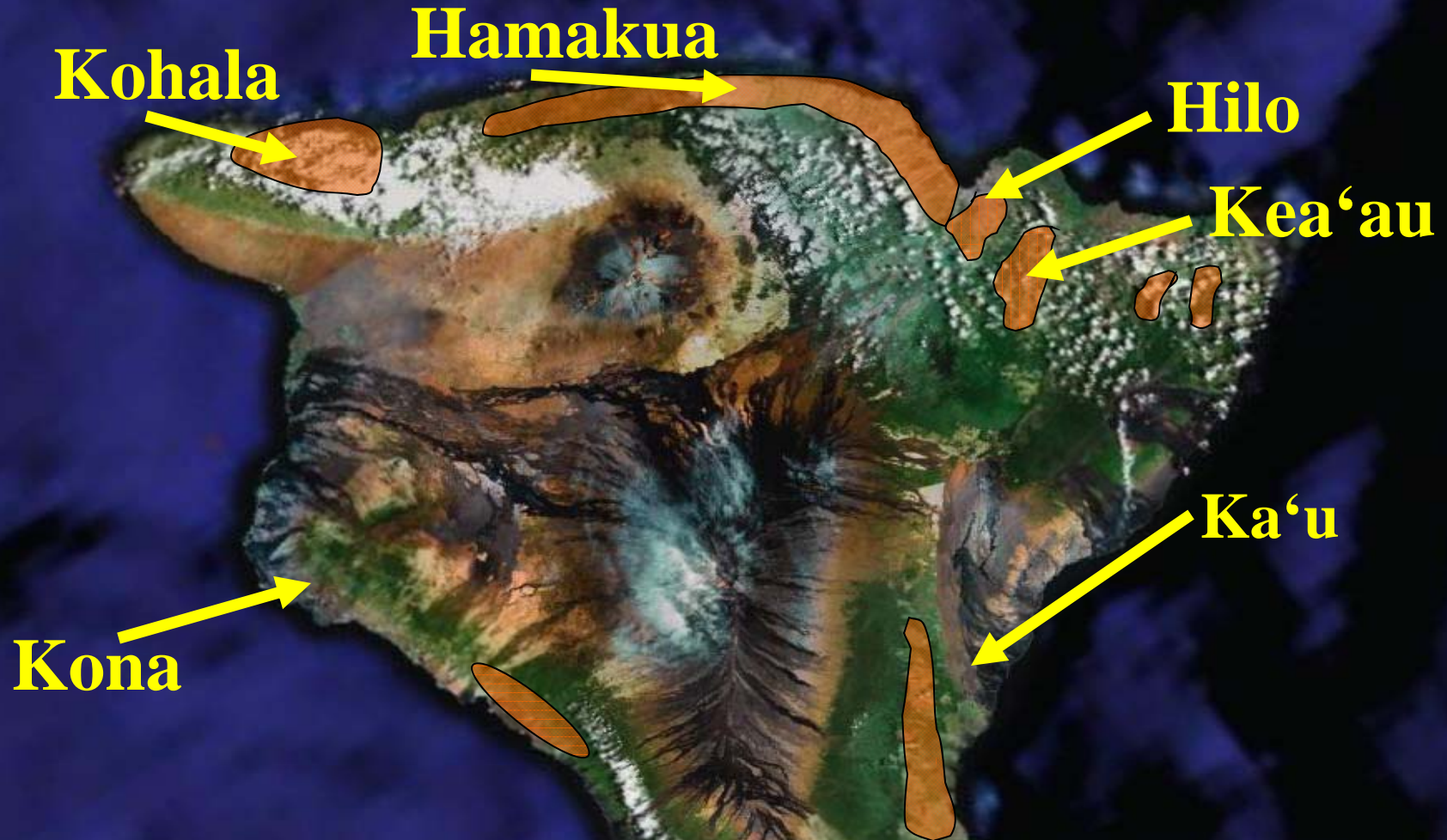
Due Diligence and Former Sugarcane Operations



Former Sugarcane Fields in Hawai'i



Big Island Former Sugar Cane Lands (1939)



>100,000 acres



20 Miles



Image © 2006 NASA
Image © 2006 TerraMetrics

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Pointer 19°31'54.85" N 155°31'56.65" W elev 10916 ft

Streaming ||||| 100%

Eye alt 108.61 mi

Primary Sugarcane Pesticides

Fields (weed management)

1910s-1940s: Arsenic-based herbicides

1940s-1960s: Pentachlorophenol (+dioxins)

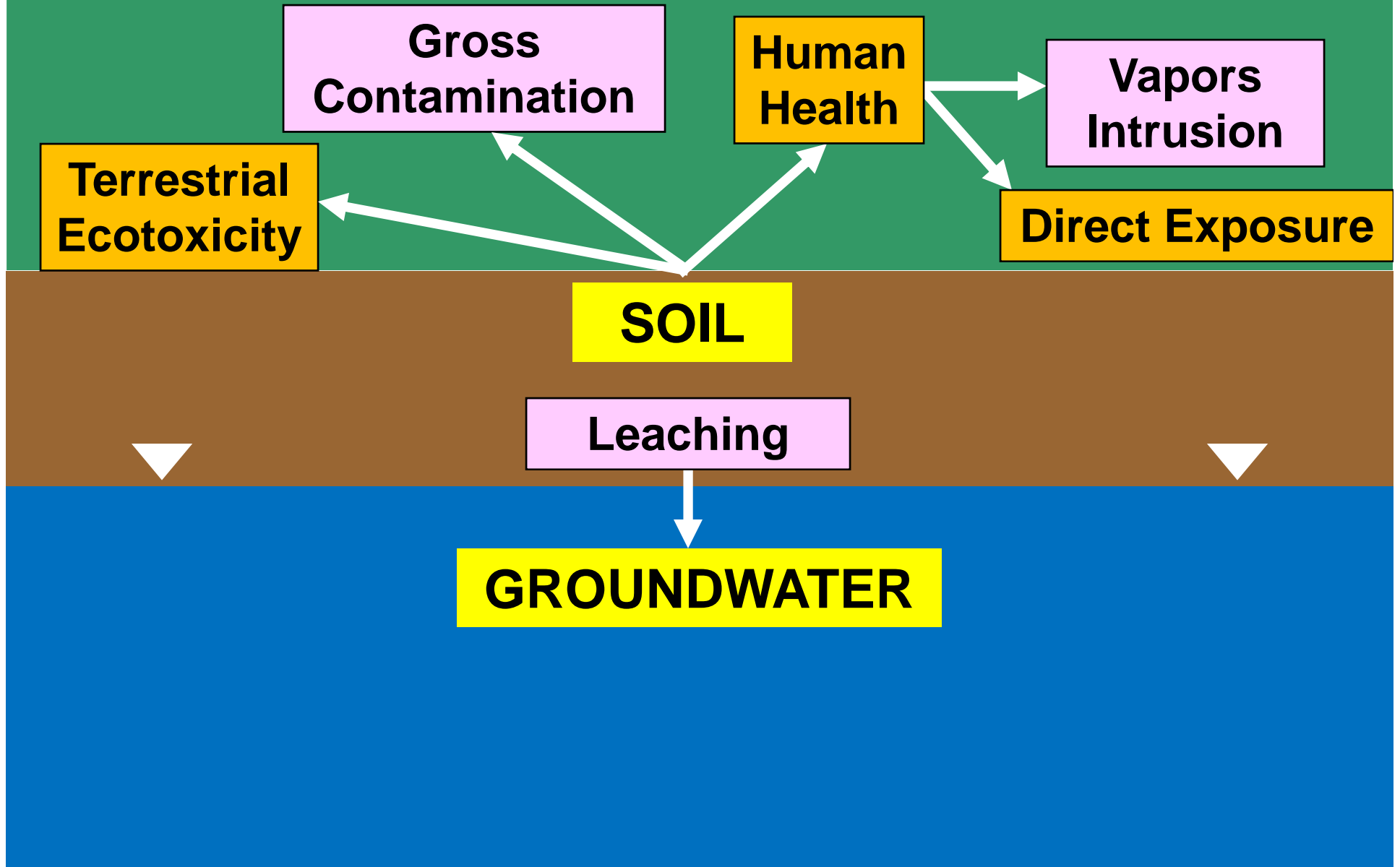
1960s-Present: Triazines (less toxic & persistent)

Seed Dipping Vats (fungicides)

1950s-1960s: Phenylmercuric acetate (mercury)

1970s-Present: Carbamates (less toxic & persistent)

Common Environmental Hazards Associated with Contaminated Soil



Soil Categories

Soil Category	Contaminant Levels
Category A	Natural background
Category B	Low: Unrestricted land use
Category C	Moderate: Commercial/Industrial use only
Category D	High: Remediation required

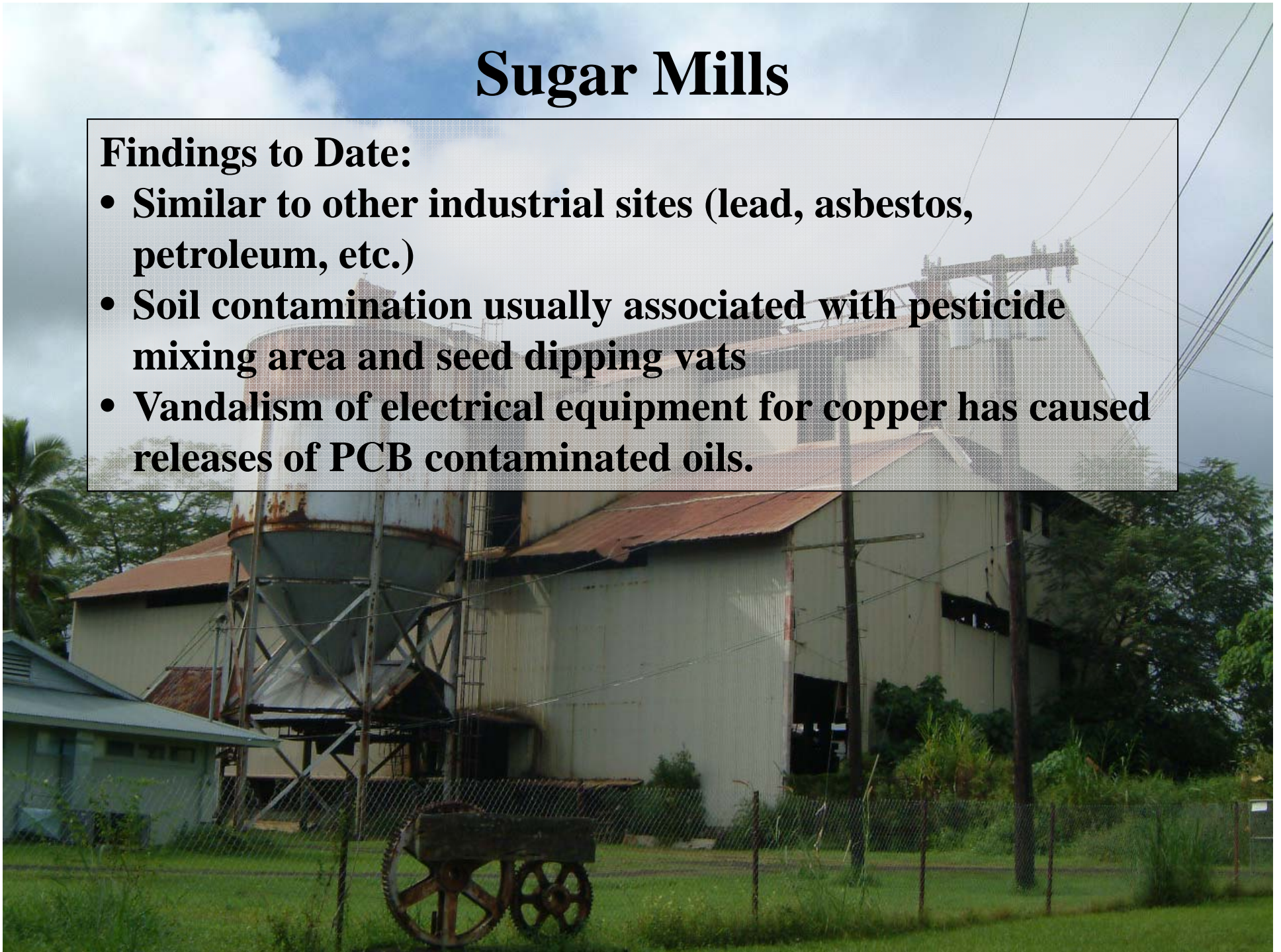
Sugarcane Operations and Potential Soil Contamination

<u>Operation</u>	<u>Primary Chemicals of Concern</u>
Sugar Mill	<ul style="list-style-type: none">• Lead, asbestos, PCBs, petroleum, etc.,
Pesticide Mixing Areas	<ul style="list-style-type: none">• Arsenic, PCP+dioxins, triazines, other pesticides, petroleum
Seed Dipping Vats	<ul style="list-style-type: none">• Mercury, other fungicides
Fields	<ul style="list-style-type: none">• Arsenic, dioxins
Bagasse, cane wash settling ponds	<ul style="list-style-type: none">• Same as fields
Dumps	<ul style="list-style-type: none">• Same as pesticide mixing areas

Sugar Mills

Findings to Date:

- **Similar to other industrial sites (lead, asbestos, petroleum, etc.)**
- **Soil contamination usually associated with pesticide mixing area and seed dipping vats**
- **Vandalism of electrical equipment for copper has caused releases of PCB contaminated oils.**



Former Sugarcane Fields

Findings to Date:

- Mostly Class B soils
- Arsenic &/or dioxins present but below levels of concern
- Other pesticides rarely detected
- Hilo Area – Higher arsenic with localized Class C soils

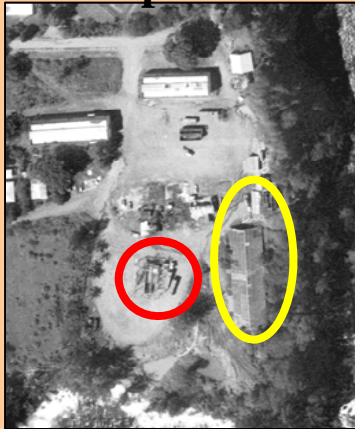


Seed Dipping Vats

Findings to Date:

- Mercury contamination at outfall (often discharged to ocean)
- Less contamination around vat

With pesticides



At mill



Near fields



Obvious



Not so obvious...



Look for the outfall



Contamination at Various Other Operations

Similar to
Pesticide Mixing Areas

Airstrip Mixing Areas



Container Dumps



Similar to
Sugarcane Fields

Cane Wash Mud
& Settling Ponds



Bagasse



Pesticide Mixing Areas

Findings to Date:

- Heavily contaminated with arsenic, dioxins and other pesticides and sometimes petroleum (Class C & D soils)
- Full remediation can cost millions
- Most sites being capped for now
- Important to identify to land transfers or redevelopment

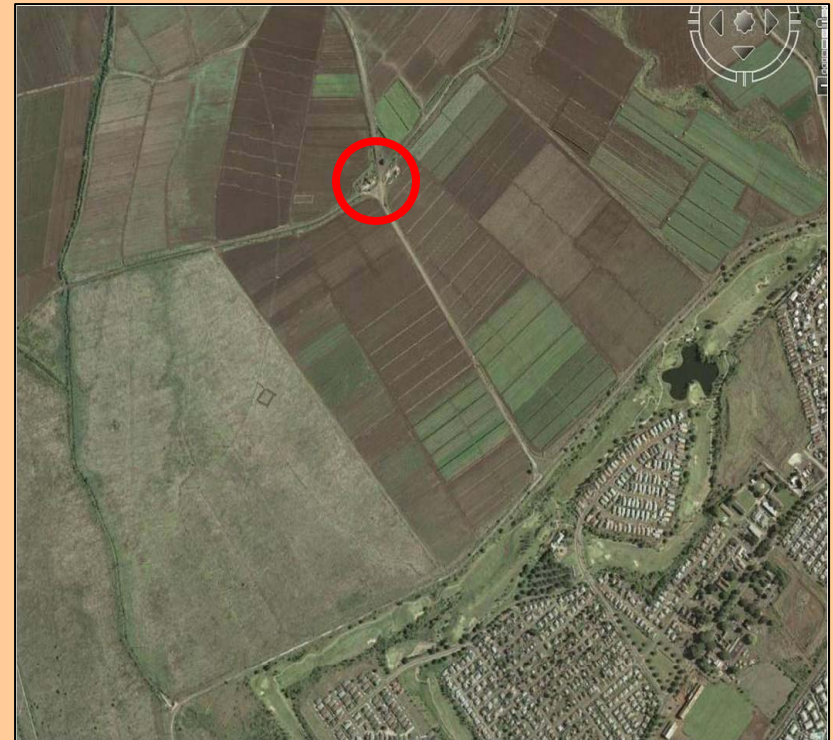


Finding them can be challenging...

Near Sugar Mill



In Fields

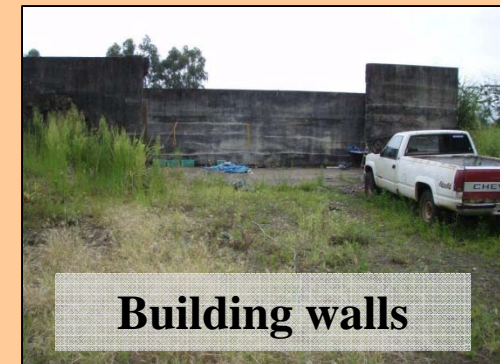


Finding them can be challenging...

Obvious (rare)



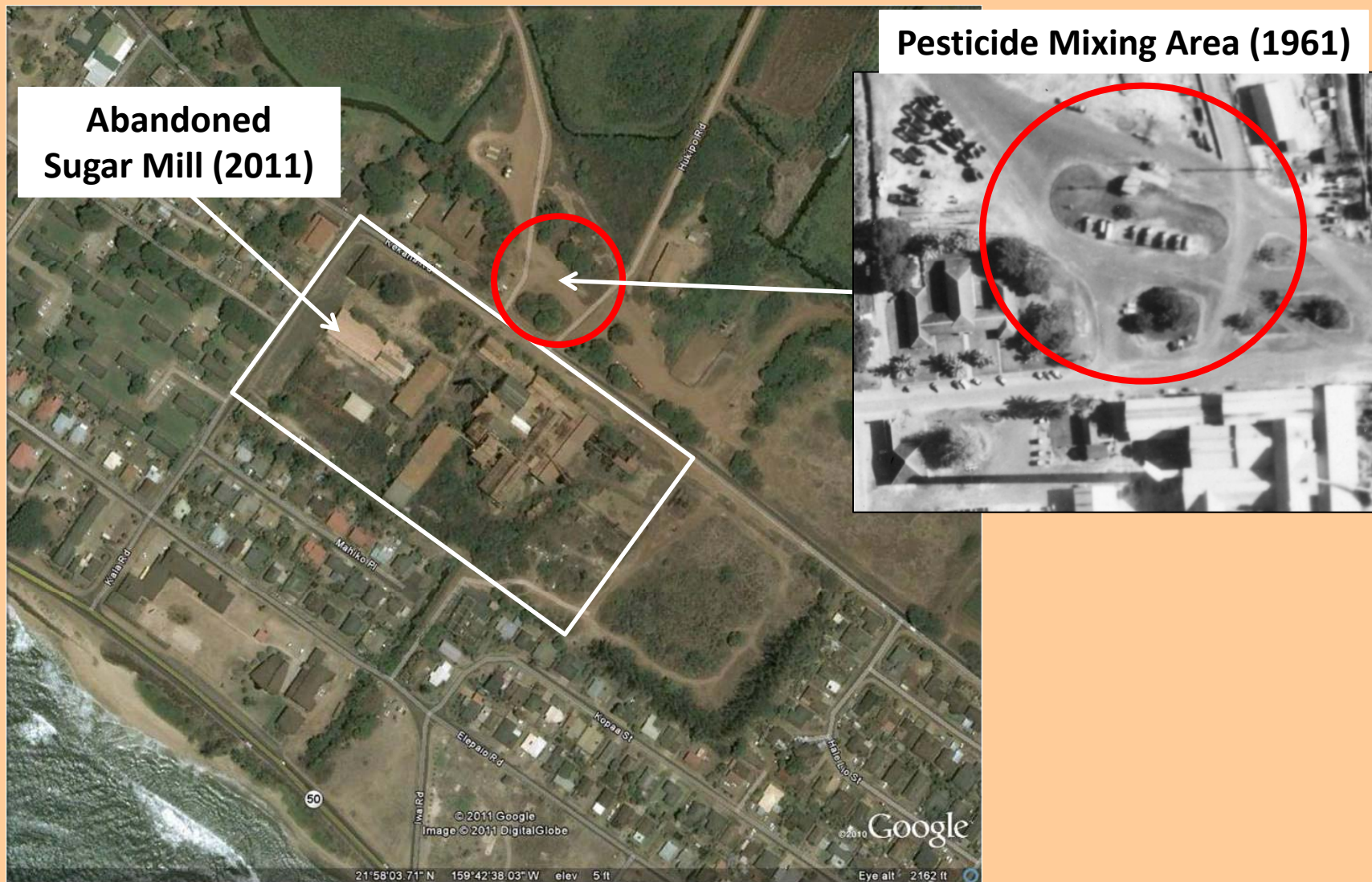
Less Obvious (usual)



Do Your Diligence

- **Sugarcane industry history books**
- **Sanborn Fire Insurance maps**
- **Historical aerial photos**
- **Local knowledge**
- **Field surveys (tanks, foundations, etc.)**

Use Historical Information



Sugarcane History Books

Former Sugar Mill (1914)

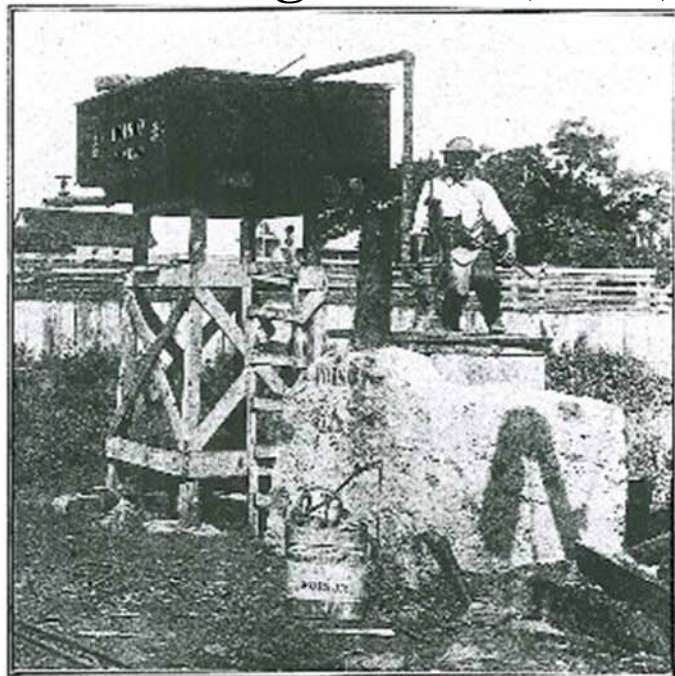


Fig. 2. Boiler and Tank for Sterile Solution of Kilomea. The solution is pumped with the small hand pump from the boiler into the tank, whence it runs by gravity into the Supply Tanks in cover compartments.

sacks that are in use at Kilomea. This has a five-inch strip of galvanized iron soldered around the top of the can. It was devised to prevent any of the solution that spills out on the top of the can from running down the sides and over the clothing of the men. It has been found decidedly effective and has eliminated one of the most objectionable features of spraying. The railroad sprayer, Fig. 3, and the sled for spraying along plantation roadways, Fig. 4, were said to have done excellent work when weather conditions permitted.

On the dryer plantations spraying has not been adapted as generally as in the moist districts. The weed problem on such

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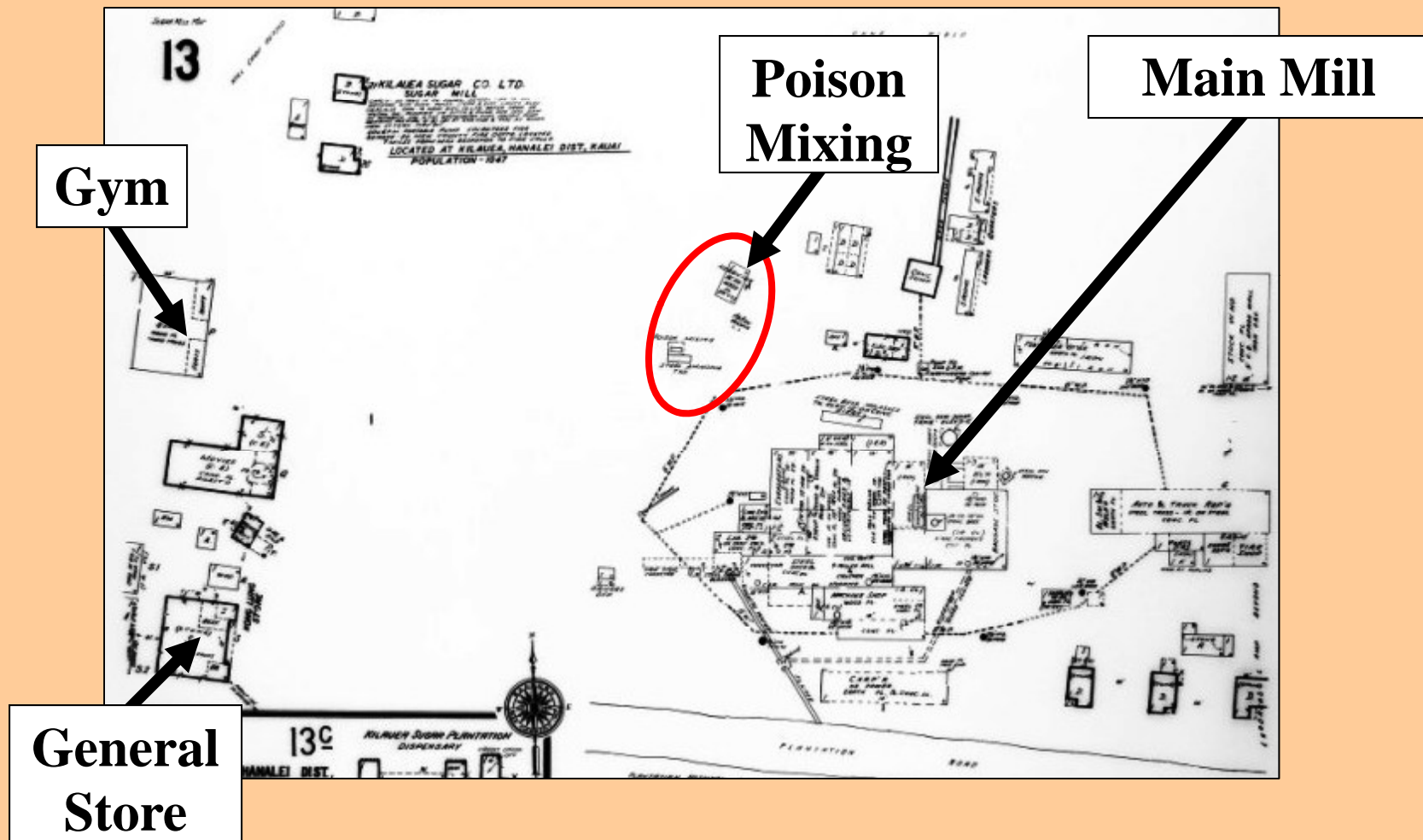
places is not of so much importance. One hoeing under dry conditions usually kills the weeds and leaves the field clean for a considerable period of time. One spraying, however, under similar conditions kills only part of the weeds outright, leaving the others to grow up again from the live stubble and roots.

On certain irrigated places it has been found that spraying as a preliminary operation to hoeing is good economy. By spraying the middle a week or two ahead of the hoe gang the cost of hoeing has been sufficiently reduced to more than compensate for the cost of spraying. It has also been asserted that one hoeing,



Fig. 3. Railroad Sprayer used at Kilomea.

Sugar Mill Sanborn Map (1960)



Former Sugar Mill (1951)



Former Sugar Mill (2011)



A bit late...



References:

Technical Guidance Manual (site investigations)

Evaluation of Environmental Hazards at Sites with Contaminated Soil and Groundwater (screening environmental data)

<http://www.hawaiidoh.org/>

Search for “Hawaii DOH TGM”