THE CITY OF KEY WEST
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TO: Sustainability Advisory Board

FROM: City of Key West, Utilities Department

CC: Alison Higgins, Sustainability Coordinator

DATE: June 7, 2019

SUBJECT: **Six-month summary report on findings at the Stock Island Landfill**

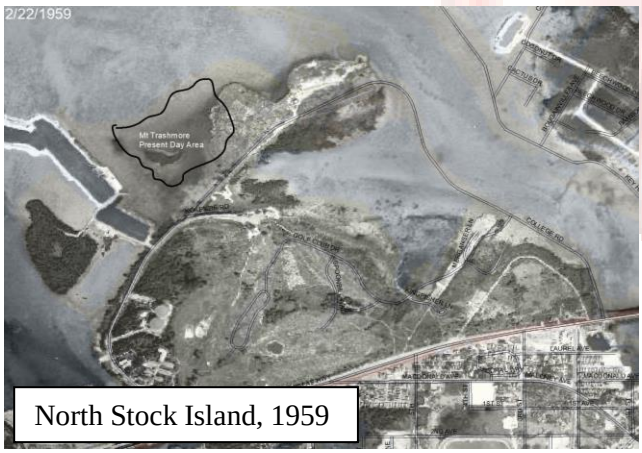
REPORT FINDINGS: No causes for alarm have been found at the Landfill, verified by reports and conversations with both the FDEP and EPA. Mining the landfill will increase leachate, dust and traffic at a considerable cost and is considered not feasible. The next report will focus on methane capture and passive uses. All reports are attached with this agenda item and can also be found on the City's website.

ACTION REVIEW:
City staff were tasked to assist the Sustainability Board with evaluating the Stock Island Landfill. Namely, to review environmental conditions, testing reports and current conditions to determine highest and best use.

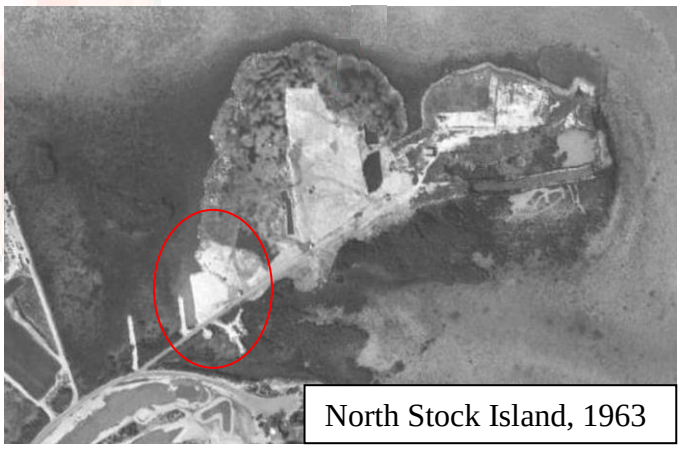
The review request included:

1. If the landfill is currently a danger to the local community or environment.
2. If "landfill reclamation" is a viable option.
3. If landfill could be used as a city park or another option like a solar park.
4. If we should leave as is.

BACKGROUND:
North Stock Island was a dumping ground as early as the 1920's. Trash and large objects were often used as "filler" to create uplands from wetlands at this time and has been evidenced throughout Key West. Historic aerials (below) show the current footprint of the landfill was mostly water as late as 1963. In the 1950's the Stock Island Dump was operational, and trash was thrown in the easternmost corner (below, right) It is believed that trenches were dug, and fill was used as the base when it became a landfill in the late 1960's.



North Stock Island, 1959


North Stock Island, 1963

Current Conditions of the Stock Island Landfill

- Elevation approximately 90 feet; Footprint 14 acres; No bottom liner or leachate collection system.

- Top cover/ cap: 18 inches of screening sand covered by one layer of 30-mil PVC geomembrane, then covered with 6 inches of bedding sand and grass. Top liner reduced greater than 99% of leachate from rain

- In at least 30 years of reporting water quality and air quality sampling for chemicals of concern to FDEP, no corrective measures have determined to be necessary. FDEP actually reduced the frequency and parameters to be sampled. The City no longer is required to sample, but still does annually.

- Landfill gas peaks roughly 5-7 years after burial but can produce residual amounts of gas for 30-50 years. It has been ~32 years since biodegradable garbage was last buried at the Key West landfill; therefore, gas production is roughly 26 years past peak. 78% of the 32 gas vents no longer have measurable amounts of gas venting.

- Certification of Completion Review:
  - Seven of 32 gas vents evidenced methane and hydrogen sulfide, only detectable inside the vent and only for a couple of hours a day. No measurable amount of either gas was found 1 foot downwind.
  - Stormwater systems are unobstructed and functional.
  - No subsidence compared to 2007 topo survey.

- Landfill Mining Study: The impact mining would have on all the residents and businesses in the area would be severe from dust and noise to exposing garbage to the elements and traffic conditions of hauling the material out of the Keys. The rough cost estimate is between $80-$180 million.

- FDEP Inspection Report: No hydrogen sulfide gases detected. Negative remarks involved: mowing the grass, some erosion on the west side of hill, removal of cars stored on site, and locks on the water wells. Most issues are already resolved.

Staff Research

One citizen brought a number of concerns to the Sustainability Advisory Board about the landfill. The concerns and current status of those concerns are as follows:

1) **No Evidence**: **Toxins are leaching out of the landfill.**

- Concerns over highly toxic military substances have been ruled out as they were usually dumped at sea. Leaching would have been at its highest from the 1920's until 1992, before the top liner was installed. Most of the trash was household garbage, but could include tires and other white goods up until 1987, when the Waste To Energy plant began. Only ash and construction debris were put in the landfill for the last 32 years.
- In at least 30 years of reporting water quality and air quality sampling for chemicals of concern to FDEP, no corrective measures have determined to be necessary.
- Only one parameter Total Dissolved Solids (TDS) was found to occasionally exceed Groundwater Cleanup Target Levels. These exceedances were at Wells #2 and #3, closest to the ocean. Due to their geography, lack of any other parameter exceedances, and with the knowledge that salinity can cause higher TDS levels, the TDS exceedances were determined to not be leachate leaks.
- Staff reviewed Florida Fish & Wildlife Commission databases back to the 1997 and found no evidence of fish kills or seagrass die-offs in the area.

2) **Not True: Sampling occurred only at low tide, purposely missing toxins and skewing data.**
Sample data from the past 20 years was spot reviewed. Samples on all wells have happened between, before, after, and during high and low tides.

3) **Not True: Heavy metals found during 2017 Gerald Adams School rebuild evidences risk.**
   - The risks at Gerald Adams were soil bound, and dangerous from dermal contact only; no gases were present in quantities of concern.
   - Many areas of Key West were dumps at one time, and the entirety of the land that Gerald Adams Elementary and the College of the Florida Keys are now built on now was a dumping ground before the landfill existed.
   - The School Board was advised to institute a Soil Management Plan during construction but was also advised that the public did not need to take special precautions with regard to working, or going to school, even while construction was going on.
   - The surface of the affected area was covered with 2 feet of fill.
   - The Landfill is already capped, has no exposed soil and no concerning levels of leachate evidenced.

4) **Not Verfied: Dangerous amounts of gas are still being produced, namely Hydrogen Sulfide.**
   - May 2019 perimeter samples taken by FDEP detected no Hydrogen Sulfide from 0-100ppm.
   - Landfill gases are 90-98% composed of methane and carbon dioxide. The other gasses include nitrogen (2-5%), oxygen (0.1-1%), ammonia (0.1-1%), sulfides (including hydrogen sulfide – 0-1%), hydrogen (0-0.2%) and carbon monoxide (0-0.2%).
   - Because of the age and volume of ash within the landfill, gas generated in 1993 was expected to be of "low quantity and quality". Passive gas vents were installed, with the caveat that if needed, active gas venting would be evaluated. Active venting was never needed.
   - OSHA lists 0.11-0.33 ppb as typical background concentrations of Hydrogen Sulfide.
   - Odor is the first main sign of Hydrogen Sulfide, the rotten egg smell that comes from its most abundant Keys source: decomposing detritus in along shorelines. The smell is noticeable at 0.01-1.5 ppm.
   - At 2-5ppm (traceable by FDEP's meter), prolonged exposure may cause nausea, tearing of the eyes, headaches, loss of sleep or airway problems in some asthma patients. At 20ppm, signs are fatigue, loss of appetite, headache, irritability, poor memory and dizziness.
   - City workers operated out of the Waste to Energy Plant at the foot of the landfill for many years without any issues. In Feb 2019, the Florida Dept of Health reported receiving no complaints of any kind about the area except for one about dust in 2013.

Timeline

- **1920's-1940's *(~80-100 years ago)***: Trash was taken to north Stock Island (Gerald Adams/FKCC), Sigsbee, Kennedy Drive (Poinciana Elem.) and dumped out at sea.
- **1938 (*81 years ago*):** No dumping ordinance passed.
- **1944 (*75 years ago*):** Federal monies announced for "modern, self-maintaining garbage collection and disposal system"
- **1950's (*~70 years ago*):** Stock Island Dump operational. Curbside service was dumped on current Gerald Adams and College of the Florida Keys property.
- **1960's *(~60 years ago):*** Became official City landfill. No waste sorting. No bottom liner, no top liner.
- **1985 (*35 years ago*):** Florida Department of Environmental Regulation (FDEP) grants permit at Class I landfill. Still no top liner.
- **1987 *(32 years ago)*:** Waste to Energy Plant begins. 150 tons of trash received daily. Only ash and construction debris put into landfill. Still no top liner.
- **1989 (*30 years ago*)** Consent Order 89-0466 from FDEP. First mention of monitoring: Submit quarterly groundwater monitoring reports of (6) cadmium, chromium, lead, mercury, Total Dissolved Solids (TDS) and zinc.

- **1990 (*29 years ago*) ~** Phase I Closure. Closed by placing 18 inches of screening sand over one layer of 30-mil PVC geomembrane and covered with 6 inches of bedding sand. 12 Gas vents installed. Ash and construction debris goes into Phase II.
- **1992** ***(27 years ago):*** Phase II Closure by same method above. 20 additional gas vents installed. With both liners: greater than 99% of leachate eliminated. City applied to FDEP for permit to close the Landfill.
- **1993** ***(26 years ago):*** Closure Plan approval conditions from FDEP: Quarterly groundwater monitoring of: (original 6) and including (9) ammonium, arsenic, bicarbonate, chlorides, iron, nitrate, sodium, Total Organic Carbon (TOC), EPA 306-601 Analytes as well as field notes of water levels, specific conductivity, pH, dissolved oxygen, turbidity, temperature, colors and sheens.
- **2004** ***(15 years ago):*** Waste to Energy closes.
- **2008** ***(11 years ago):*** **~** 2 subsidence areas found and filled. No tears in liner.
- **2011** ***(8 years ago):*** According to new State rules, FDEP sent a letter to amend the Closure plan to 1) reduce water quality sampling to bi-annually and 2) increase lab parameters to include 45 new volatiles. The City was already doing this 6-months earlier.
- **2014** ***(5 years ago):*** FDEP letter reduces groundwater sampling back to lead, mercury, chromium, cadmium, zinc and TDS. Frequency stays at bi-annually.
- **2015** ***(4 years ago):*** Water Quality Monitoring Technical Report to FDEP. Covering June 2011-2015. Only one parameter was found to occasionally exceed the Groundwater Cleanup Target Levels: Total Dissolved Solids. Because 1) TDS can be affected by salinity, and 2) no other parameters were exceeded, it was determined to not be a leachate leak concern.
- **2016** ***(3 years ago):*** **~** FDEP Consent Order Ends. Released from Long Term Care and monitoring. Still required to maintain liner, stormwater management, pest management and grounds maintenance. City voluntarily performs annual groundwater monitoring.
- **2019**: Requested FDEP Inspection found no hydrogen sulfide gases. Compliance measures included moving old City vehicles, installing a lock on one monitoring well and mowing the grass.