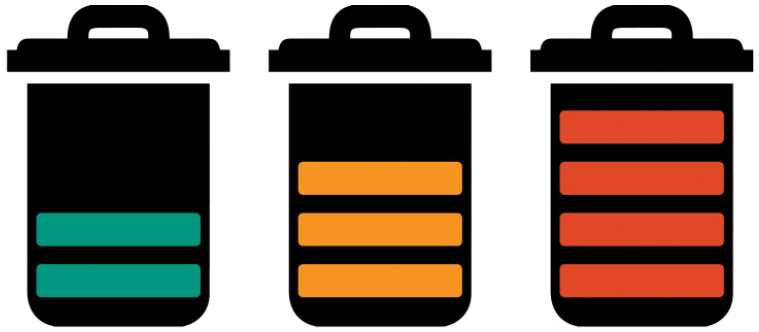


VICTOR STANLEY RELAY™

STREET LEVEL SENSING™ & WASTE CONTROL SERVICE

Contains Confidential, Proprietary, and Privileged Information

RECYCLING & WASTE COLLECTION: THE CURRENT SYSTEM

Containers are collected regardless of fill level

Some containers are overflowing before they are collected, while others sit empty, yet are picked up anyway

Costs incurred:

- Monetary
- Environmental
- Community

RECYCLING & WASTE COLLECTION: AN IMPROVED SYSTEM

Based around *actual data* collected from the containers themselves, not on “how we’ve always done it” inertia

Efficient resource allocation saves an estimated 20-40% in collection expenses

Elimination of overfilling improves

- Aesthetic appeal
- Community satisfaction

Collection fleet optimization reduces

- Fuel waste
- Traffic congestion
- Environmental impact

SYSTEM FUNCTIONS

Measures distance between sensor and top of material inside container

Transmits that information to those responsible for collection

Integrated solution designed to be hidden in plain view

Compatible with any material type

WEIGHT SENSOR

Helps measure and **improve landfill diversion** rates at a granular level

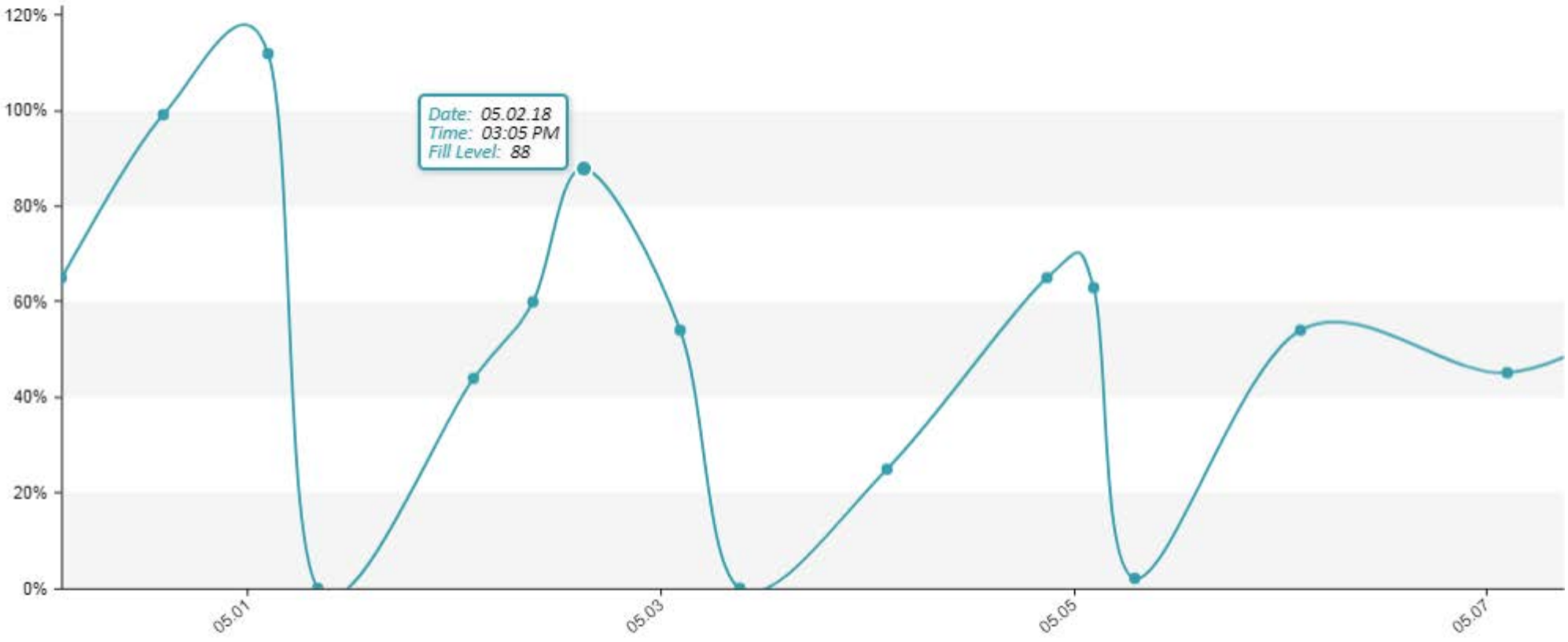
Additional **accountability** from per-weight recyclable payments

Ensuring compliance with employee **labor restrictions**

CURRENT & HISTORICAL DATA – CONTAINER HISTORY

See how full your containers are when they are collected

Verify if containers are going days without being serviced



ALERT MANAGEMENT

Text message or email-based notifications sent to party responsible for collection

Alert	Email	Text
Nightly Reports	ON	
High Temperature Detected	ON	ON
Overflow Bin Detected	ON	OFF
Fill Level Spike Detected	ON	OFF
Rummaging Detected	ON	OFF
Fill Threshold 1 Reached	OFF	ON
Fill Threshold 2 Reached	OFF	ON
Fill Threshold 3 Reached	OFF	ON
User can alter alert settings	ON	

- Container Overflow Detection
- High Temperature Detection (Possible Fire)
- Rummaging and Rodent Detection

BATTERY MANAGEMENT

BATTERY LIFE EXPECTANCY

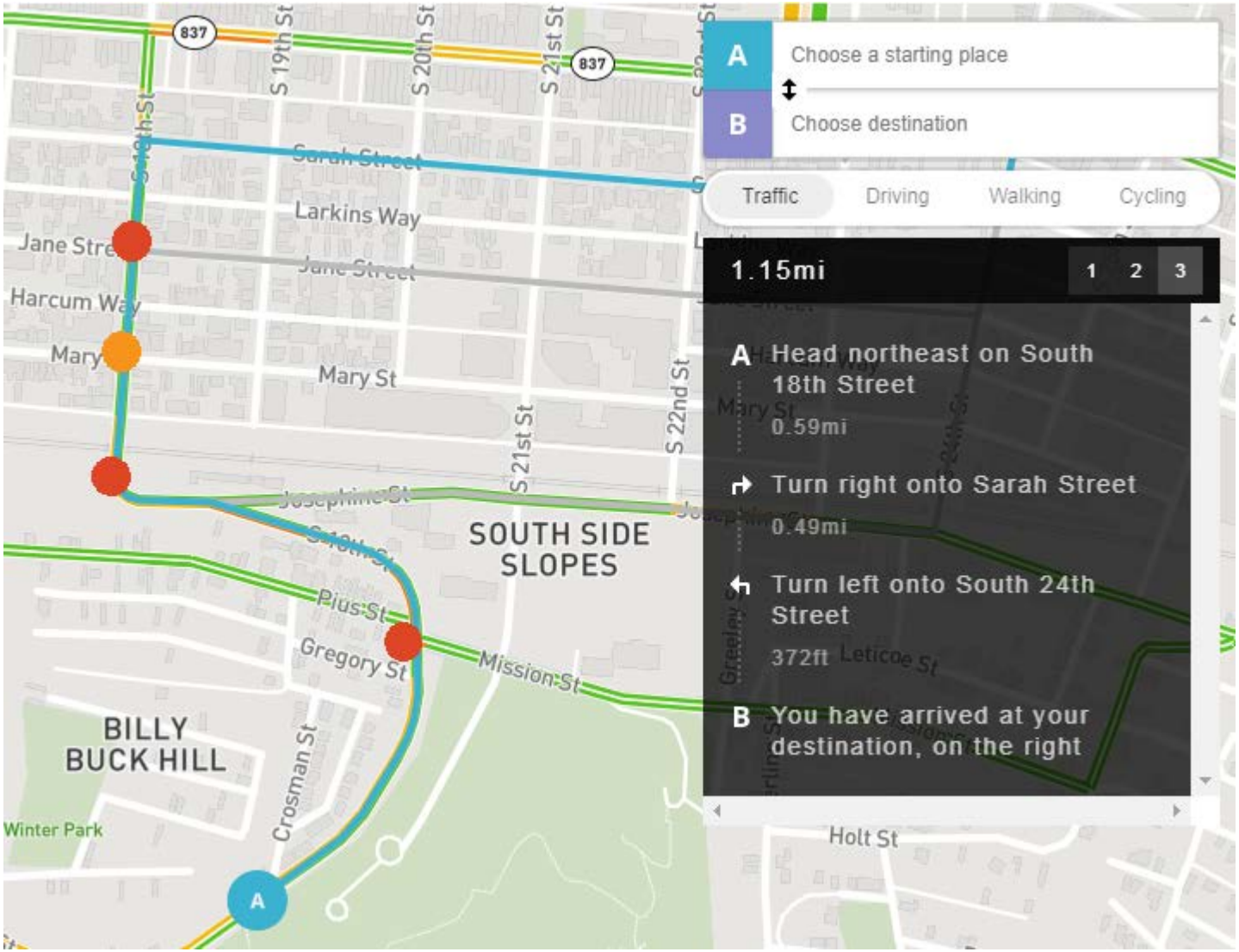
Environmental		Configuration					Battery
Ambient Temperature (Avg.)	Wireless Signal Strength (Avg.)	Configuration	Readings (Avg. Per Day)	Reporting (Avg. Per Day)	GPS Usage (Avg. Per Activation)	GPS Usage (Avg. Per Year)	Life Expectancy* (Years)
-10°F to +110°F (-23°C to +43°C)	90% to 100%	A	24	1	1	1	10
		B	24	2	1	1	6-3/4
		C	24	3	1	1	4-1/2
		D	24	4	1	1	3-1/2
		E	24	5	1	1	2-3/4
		F	24	6	1	1	2-1/4

*All battery claims depend on the cellular network, location, signal strength, environment, configuration, usage, 10% battery manufacturer defect rate, and many other factors; actual results will vary. This document contains typical information specific to products manufactured at the time of its publication for reference only. Contents herein do not constitute a warranty.

*Information and specifications are subject to change without notice

- Easily replaceable with keyed latch
- Replacement covered during contract

TURN-BY-TURN ROUTING



Live traffic conditions display on every map within the Relay portal.

Our routing algorithm will optimize pickup routes and improve collection efficiency.

UPCOMING SYSTEM ADD-ONS

Relay Environmental Sensing Add-on Device

- **Pedestrian Activity Detection & Alerting** – Pedestrian counting, direction, flow and crowds
- **Pollution Detection & Alerting** – Air, noise, light, and chemical
- **Odor Detection & Alerting** – Local area and within container
- **Noise Detection & Alerting** – Gunfire, construction, and outdoor nuisances
- **Localized Climate Detection & Reporting** – Ambient temperature, humidity, atmospheric, altitude, and snow depth (sidewalk and street service detection)
- **Solar Energy Harvester & Solar Power Enabled**

CASE STUDY:
CITY OF PITTSBURGH

VICTOR STANLEY®

The City of Pittsburgh Modernizes Their Waste Collection Process While Combating Climate Change

CASE STUDY:
CITY OF PITTSBURGH

Pittsburgh, Pennsylvania, is a city rich with industrial legacy, but is forward thinking in its relationship with technology. When city leaders were tasked with updating their waste collection process to reduce inefficiencies and provide cleaner streets, they turned to a data-driven solution. A solution that fits hand-in-glove with their ambitious goals in the fight against climate change – taking steps towards reducing greenhouse gases, curbing CO2 emissions, increasing renewable energy use, and attempting to achieve Zero Waste.

For the modernization of their trash collection system, the city recognized a significant problem of not knowing which of their 2,000 litter receptacles required collection at any particular time. Without data about fill levels, they had no choice but to drive the full collection routes every day. Inevitably, some containers would be already overflowing by the time the crew arrived, and other areas would have no containers requiring collection, but each receptacle had to be serviced.

In 2016, Pittsburgh began implementing the Victor Stanley Relay™ smart waste management system to upgrade to a more efficient waste collection process. Using sensors embedded within their litter receptacles that measure how full the containers are, and then transmit that information to the people responsible for collecting them, the city found a way to create and utilize

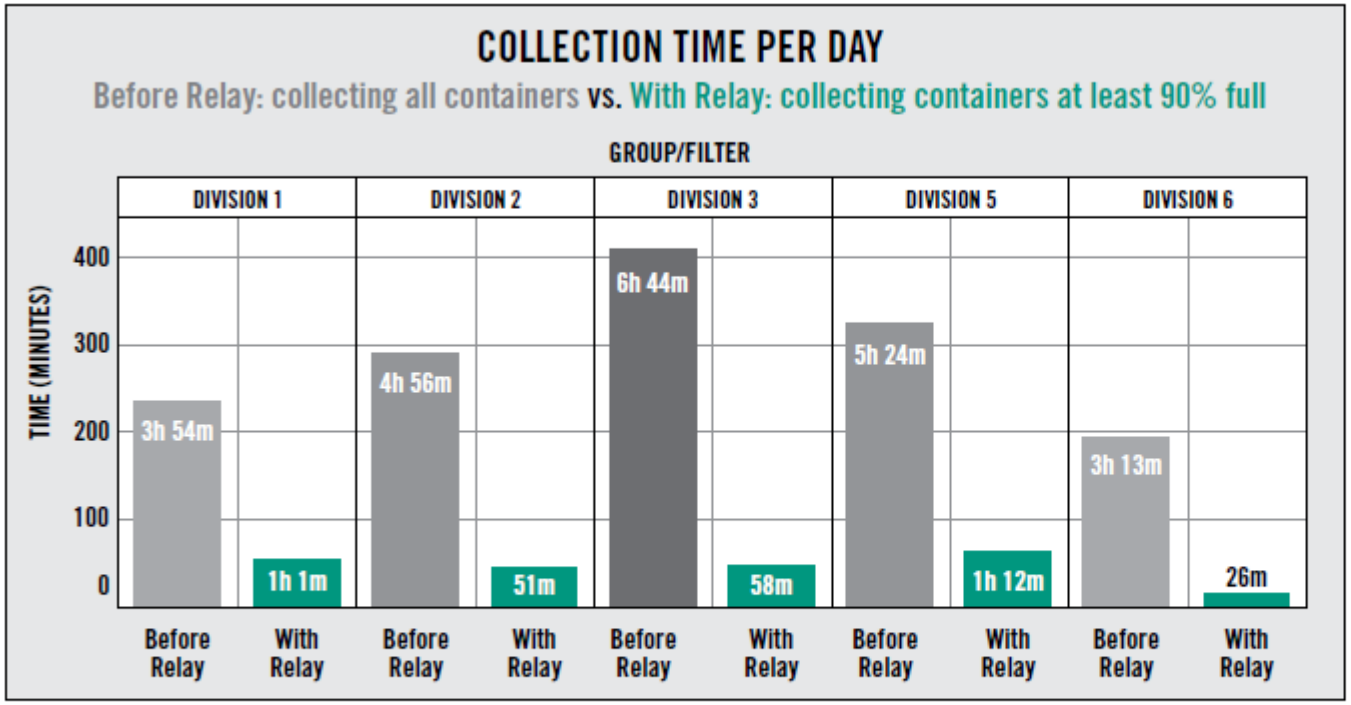
CASE STUDY:
CITY OF PITTSBURGH

Relay sensor with replaceable batteries embedded within dome lid

The data gathered from this deployment reflected the astonishing statistic that, on any given day, an average of only 13% of the city's containers would reach the 90%-full threshold that represents critical need for collection.

Relay-enabled SD-42 being serviced on a Pittsburgh street

CASE STUDY:
CITY OF PITTSBURGH



Number of containers collected (Daily sample)		
Division	Before Relay	At least 90% full
DIVISION 1	158	2
DIVISION 2	300	41
DIVISION 3	290	16
DIVISION 5	250	26
DIVISION 6	134	6
TOTAL	1,132	91

CASE STUDY:
CITY OF PITTSBURGH

Costs		
Type	Unit	Daily
Laborer* Driver*	$19.52 $21.52	$193.64 $213.48
Equipment & Fuel**	$36.84	$294.72

A cost savings analysis [1] provided even further justification for collecting only the containers which reach at least 90% full, instead of collecting containers regardless of fill level. Incorporating wages for the truck drivers and laborers, and the costs of equipment and fuel, the savings analysis shows that the 90% full collection model can achieve an average monthly savings of more than $128,000. This translates to roughly $1.54 million over the course of a year. Even if the city took a more conservative approach and collected only containers at least 75% full, they would still save an average of more than $1 million per year.

"I believe it's going to be almost a couple million dollars savings."

-Mike Gable, City of Pittsburgh Public Works Director [2]

CASE STUDY:
CITY OF PITTSBURGH

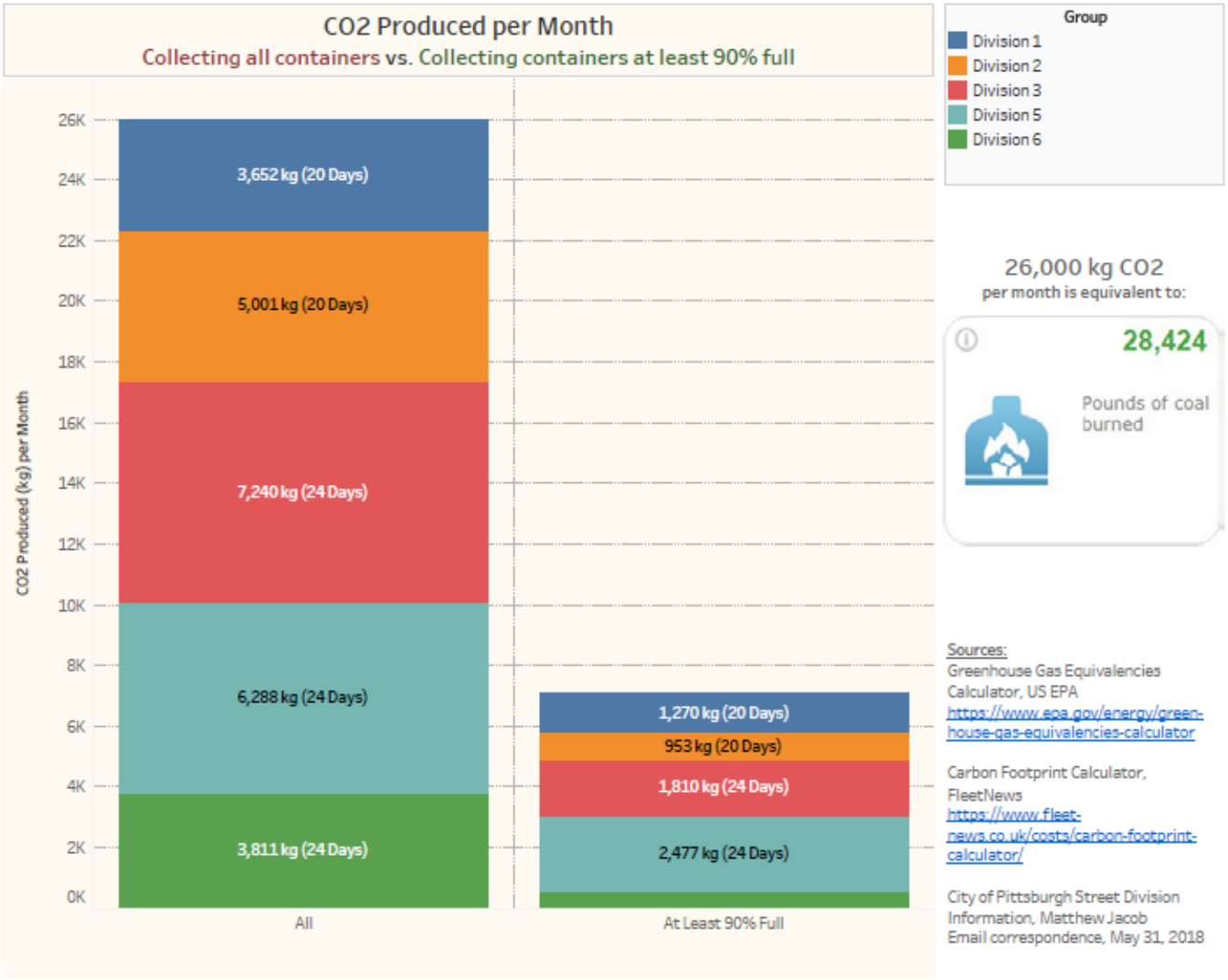
Equipment depreciation costs are reduced, fuel use is significantly reduced, and the laborers previously making superfluous trips to unfilled containers can be reallocated towards higher priority items instead. Many of these tasks have an immediate and tangible impact on the public, such as responding to citizen-initiated 311 requests, street cleaning, and filling potholes. Pittsburgh's Public Works Department used this data to determine that they could reduce the number of employees previously occupied exclusively with trash collection from 25 down to 9. Instead of downsizing the department, the other 16 employees are being reassigned to tasks such as "more lot cleanup, more getting into the catch basins, pruning trees, things that have been waylaid for years" according to Public Works Director Mike Gable.[2] Internalizing this information and having a better understanding of how many containers are filling up on a given day – and how much time was being spent servicing containers unnecessarily – also gave the city confidence to consolidate their six divisions

CASE STUDY:
CITY OF PITTSBURGH

The Relay routing system navigates to only the containers in need of collection

Using the Relay routing algorithm to determine the most efficient path for reaching only the containers that require collection will also reduce the amount of time that these diesel heavy trucks will spend on the road. The amount of CO2 produced by heavy diesel trucks in Pittsburgh's fleet that are maintaining a standard waste collection operation – driving to every container – could be reduced dramatically by changing to a more efficient collection operation, where only containers reaching at least 90% full are serviced. This reduction could be as high as 26,000 kg of CO2 per month, which is roughly equivalent to 28,000 pounds of coal burned. Additionally, the more efficient collection route would mitigate emissions not only from the collection vehicles themselves, but also from the other vehicles nearby, which will experience fewer traffic delays caused by trucks on prolonged collection routes. "The supervisors on any given day should be able to generate the number of cans that need to be emptied and the route that the driver should take" Gable said. (2)

CASE STUDY:
CITY OF PITTSBURGH



Sources:

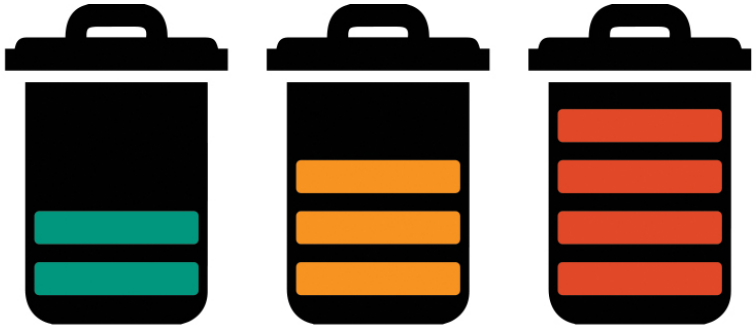
Greenhouse Gas Equivalencies Calculator, US EPA
https://www.epa.gov/energy/green-house-gas-equivalencies-calculator

Carbon Footprint Calculator, FleetNews
https://www.fleet-news.co.uk/costs/carbon-footprint-calculator/

City of Pittsburgh Street Division Information, Matthew Jacob
Email correspondence, May 31, 2018

CO2 reduction potential with Relay deployment

Q&A:
ANY QUESTIONS?



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