



TELUS Smart Waste Systems

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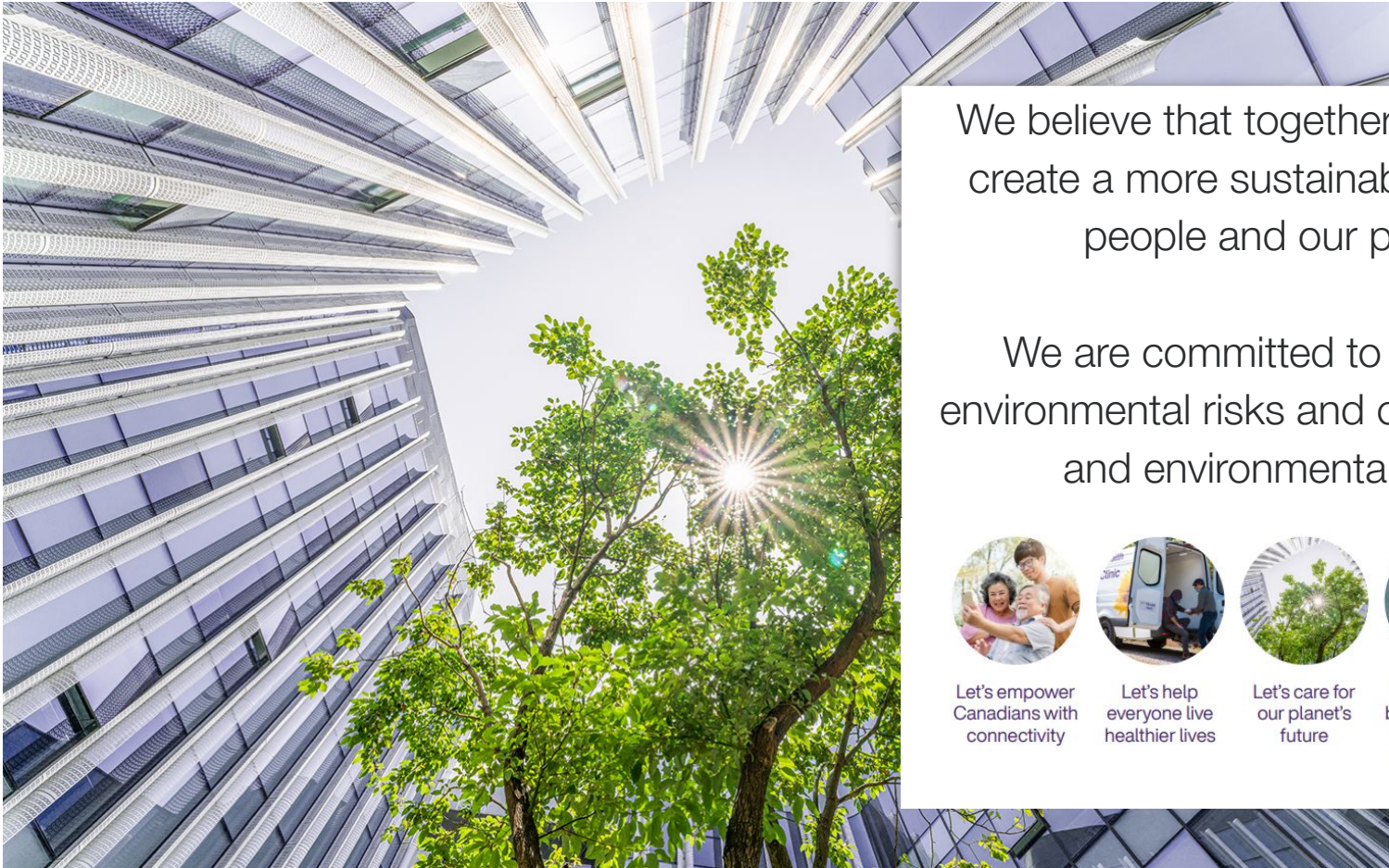
April 26th, 2023





Agenda

1. 9:30am - 10:30am: Presentation
 - a. Intuitive AI's Oscar Sort
 - b. Smart Waste Sensors
2. 10:30am - 11:25am: Site tour
3. 11:25am: Retrieve personal items
4. 11:30am - 12:30pm: Lunch and networking in collaborative space



We believe that together, TELUS can create a more sustainable future for people and our planet.

We are committed to managing environmental risks and creating social and environmental value.



Let's empower Canadians with connectivity



Let's help everyone live healthier lives



Let's care for our planet's future



Let's build a better and more sustainable global food system



Let's give where we live

Leading in sustainability



Enhance operational excellence and leadership

- Environmental risk and compliance management
- Energy and GHG management
- Sustainability governance



Expand sustainability integration and advocacy

- Supply chain sustainability
- Circular economy
- Internal support



Grow our business and strengthen our brand

- Disclosure, communications and marketing
- Sponsorships and partnerships
- TELUS Environmental Solutions

TELUS Proprietary



Our environmental commitments



Energy

100% renewable or low-emitting energy by 2025



Greenhouse gas emissions

Net carbon neutral operations by 2030



Waste

Zero-waste by 2030



Water

50% usage reduction by 2030

Environmental Management System
Environmental Policy



Waste

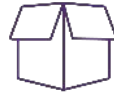
Zero waste vision



5%

Reduction in total materials discarded

- Eliminate waste at the source



10%

Reduction in paper and packaging used

- Go paperless
- Optimize packaging



80%

Diversion of waste from TELUS sites by 2030

- Increase diversion streams



95%

Diversion of additional waste streams by 2030

- Shift to circular product lifecycle

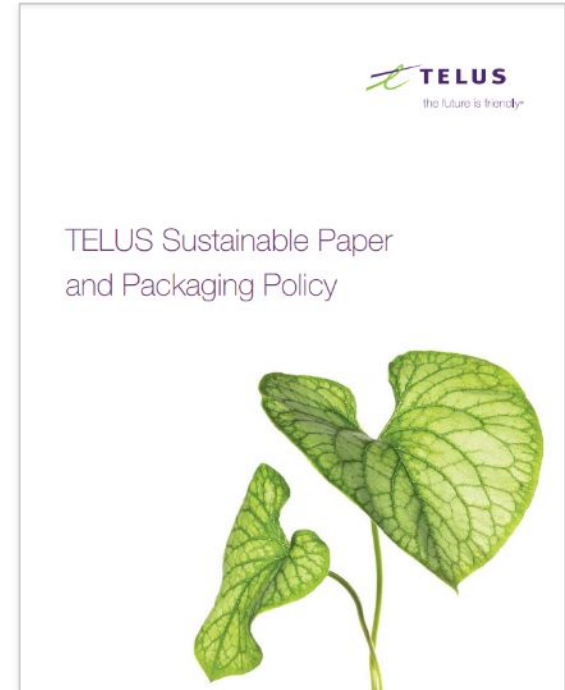
Sustainable Paper & Packaging Policy

- Responsible procurement
 - Maximize use of recycled and renewable materials from well-managed sources

- Responsible use
 - Eliminate over-packaging

- Increase recovery and recyclability
 - Design to be easy to take apart

- Responsible design
 - Minimize use of materials

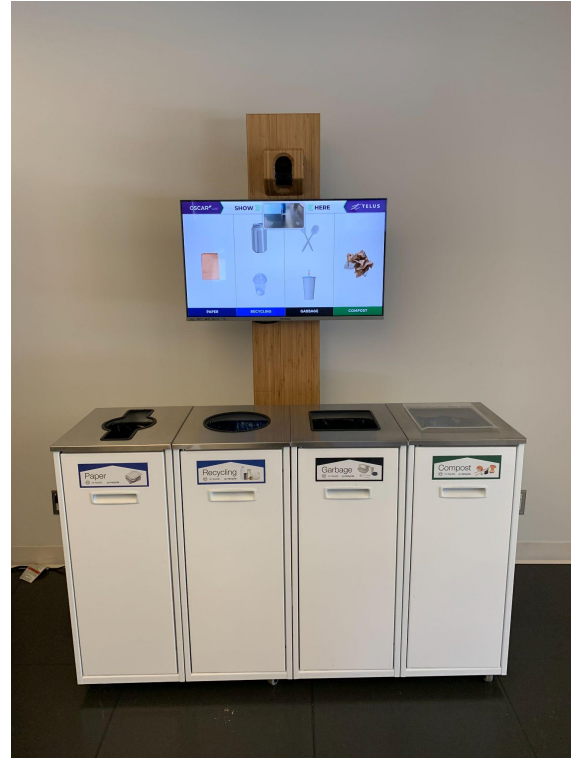


Key Challenges

- Meeting the 5% reduction in total waste discarded target
 - Low diversion rates at TELUS offices
- Full bin assumption by waste hauler
- Weight density application is inconsistent
- Missing waste data
- Bin contamination



Intuitive AI: Oscar Sort

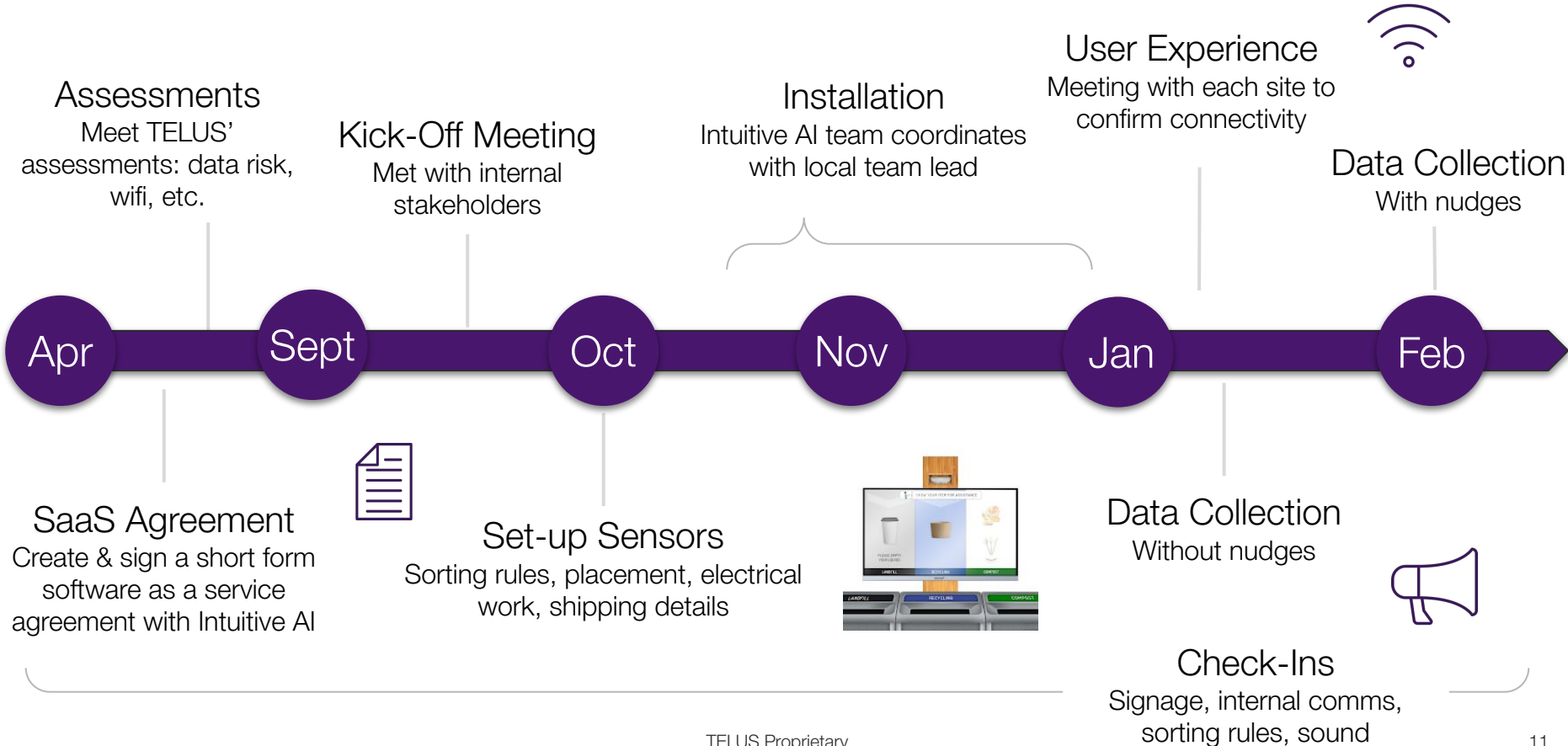


How Oscar Sort Works

- ✓ TELUS team member walks up to the sensor and shows it the item it would like to dispose of.
- ✓ The sensor uses images and sounds to nudge the team member to the correct bin.
- ✓ The sensor measures the disposal accuracy, total disposals, top contaminants (%), and bin contamination.
- ✓ Data analysis provides the user with actionable insights.
- ✓ Can create site specific comms to target correct disposal of top contaminants.
- ✓ Create competition between offices.



Oscar Sort Timelines



Our February Performance



57.6%

12.7% ↑ from January

*Disposal accuracy



571

16.5% ↑ from January

Total Disposals



Our February Performance

Our top contaminants by percentage

Material	% Incorrectly Disposed	# Incorrectly Disposed
Coffee cup	43.1%	25 incorrectly disposed 58 total disposed
Coffee cup lid	51.1%	23 incorrectly disposed 45 total disposed
Napkin	50.4%	71 incorrectly disposed 141 total disposed



Our February Performance

Contamination by bin

Bin	% of Contamination	Top 3 Contaminants
Compost	26.7%	Plastic cutlery, coffee cup, wrapper
Glass, Metal, Plastic	50%	Napkin, plastic bottle, coffee cup
Mixed Paper	73.4%	Napkin, coffee cup, food box
Mixed Recycling	44.6%	Black coffee cup lid, napkin, coffee cup



Next Steps

Monitor Experience



Personalized Screens



Analyze Data



Smart Waste Sensors = Significant Opportunities



Current waste collection methods contribute up to a **higher level of CO₂ emissions***



Pickups that are too early or late result in **higher collection costs****

~50% of waste is picked up
at the wrong time*

A Data Driven Urban Future

You can't manage what you don't measure

Data-driven solutions are central to making waste operations more efficient and effective.



Asset utilization



Bin fill levels & fill rates



Bin type & size



Optimize collection routes



Vehicles loads & frequencies



Temperature



Bin distribution & control



Historical data



What If We Made Cities & Campuses and Organizations Smarter?

Increase operational efficiencies of labor & resources helping cities, campuses & organizations save money

Reduce collections & meet CO2 reduction targets with substantially fewer trucks on the streets.

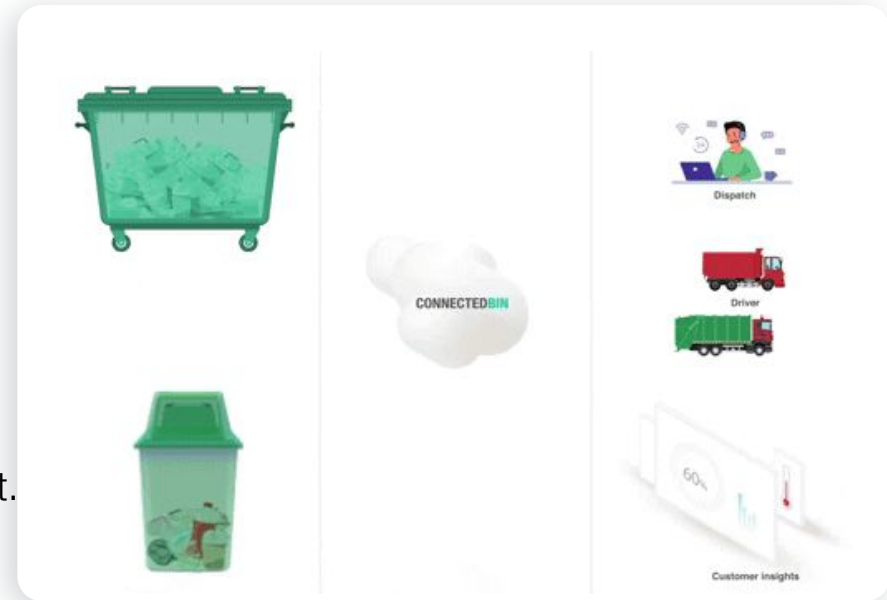
Reduce overflowing bins and citizen complaints & contamination

To optimize urban planning initiatives & **support recycling measures**



How the Sensor Works

- ✓ A fill-level sensor is placed in a garbage or recycling bin.
- ✓ The sensor transmits hourly data to the cloud.
- ✓ The sensor measures fill levels (& other data points) sends alerts for pick up at predetermined levels.
- ✓ Data analysis provides the user with actionable insights.
- ✓ Mobile route optimization is another significant benefit.
- ✓ Batteries will last to 3-5 years+.



TELUS Smart Waste Sensors

Monitor bin fill levels with
real time images

Detect Contamination with
AI powered software

Support quantification of
waste composition



Industries Transformed



Municipal Waste & Recycling
Bins (Indoor/Outdoor)



Airports, Zoos, Parks,
Aquariums, Public Transit



Colleges & Universities



Waste Haulers



Environmental, Oil
& Gas



Private & Public Sector
Recycling
(clothing, batteries, organics)



Private Sector
Enterprise, Retail



Healthcare / Hospitals
(Medical Waste)

Applications / Advantages



Sustainability

Asset
Management

Weight Tracker

Reporting

Container
Management

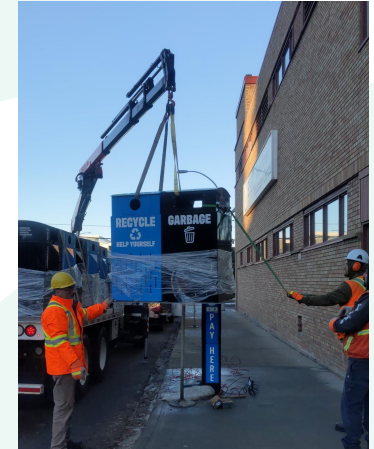
Routing

Edmonton Downtown Business Assoc. | Street Bins

EDBA use case includes 10X bins with a focus on the data. They want to understand the impact of the new bins and establish a baseline for moving forward with sensors for ALL public space bins (waste & recycling).

City of Edmonton is also evaluating progress. They will be providing commercial pickups for the entire city of Edmonton in 2024.

- Optimize Operational Costs
- Reduce Infrastructure Costs
- Reduced Environmental Impact
- Acquire Deep Insights and Analytics

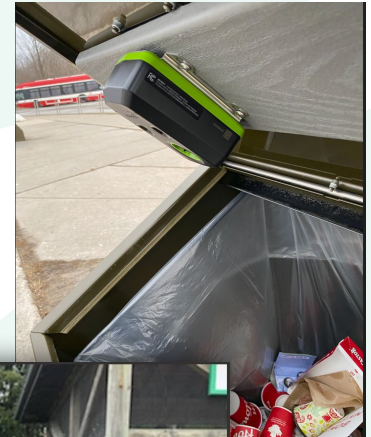


Toronto Zoo | Public Space Bins

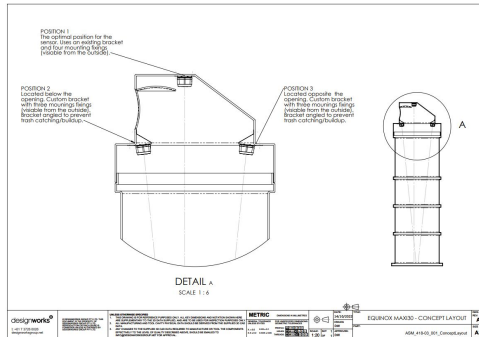
Toronto Zoo study includes 18 bins with a focus on collecting data across different zones.

They want to understand fill rates with the goal to reduce pickups as well as using the data to better understand foot traffic across zones.

- Optimize Operational Effi
- Reduce Environmental Impact
- Acquire Deep Insights and Analytics



City of Windsor | Equinox Bins



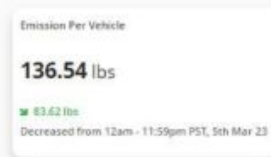
In this case, the bin manufacturer (Equinox) was engaged to establish a successful install on a single bin before executing the pilot project.

The bins are ~8 underground with no way to know when they are ready for pickup.

The successful pilot will optimize collection schedules which will support a reduction of operational costs.

Sustainability KPIs for a Safer, Cleaner and Efficient Mobility

- Carbon emissions
- Driver safety
- Mileage detection
- Hazardous gas detection
- Route optimization
- Fuel Efficiency
- Sustainability reporting



Contamination Level Alert 
BIN123 - Gas contamination level of 64% detected.



Garbage trucks emit an average of 0.86 pounds of CO2 per mile

let's make the future friendly™

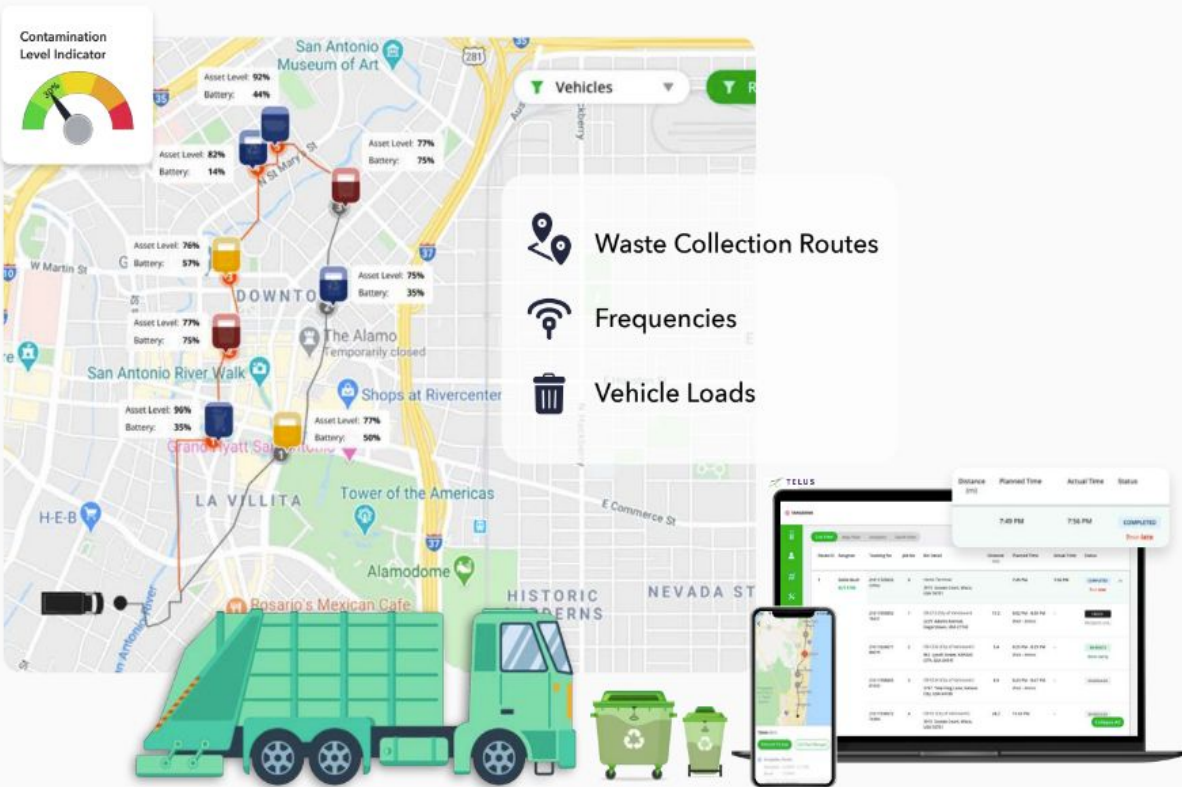
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Enhancing Data Insights with Asset Tracking and Monitoring Tools



Waste Management Tools

- ✓ Superior fill-level sensor technology
- ✓ Contamination levels and alerts
- ✓ Dynamic scheduling for waste collections
- ✓ Sustainability planning and reporting
- ✓ Overview of planned and actual routes
- ✓ Visibility into fixed and moving assets
- ✓ Monitor driver behavior



Consistent and Cohesive Customer Experience through Integration

- ✓ White labeling and customization
- ✓ 3rd party device and data integration
- ✓ Connected workforce
- ✓ Remote maintenance support