Food Waste Composting for the benefit of Organic Food Production

Trial Completed In: Squamish Lillooet Regional District, BC
Trail Commenced: June 2012
Trial Completed: December 2013
Project Report To: Organic Sector Development Program (I-142)

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Report Prepared By: Mateo Ocejo; P.Eng
Jaye-Jay Berggren

EXECUTIVE SUMMARY:

The growth of the Organic Sector in the Pemberton Valley has been significant over the past few decades. This has led to increased food production and the development of local agri-tourism industry which is healthy for the community and includes the expansion of farmers markets and the development of new events such as the slow food cycle which has increased in both popularity and in size since its inception. While the valley has great sun exposure and healthy disease resistant soils, it is lacking the high levels of organic matter and agricultural fertilizers and amendments to optimize the production of food. As the Fraser Valley has a high number of livestock applications, (mainly chicken) manure is abundant for crop fertilization. This manure and other certified agricultural amendments are currently hauled great distances to the Pemberton Valley at a high cost to the farmer as the trucks typically return empty. At the same time, and due to the recent closure of local landfills, and the rise of fuel prices and transportation charges, the cost of waste disposal has increased exponentially over the past decade. This has encouraged a push to remove organic products from the waste stream so that they can be recycled and save the community money. This issue is highlighted in the Whistler area during the peak season months from December - April as the region's population spikes with tourism visitors and food waste produced from local restaurants increases drastically. We are working with local restaurants on a Waste Wise Program (see below) that will highlight their participation and support in the weeks ahead.

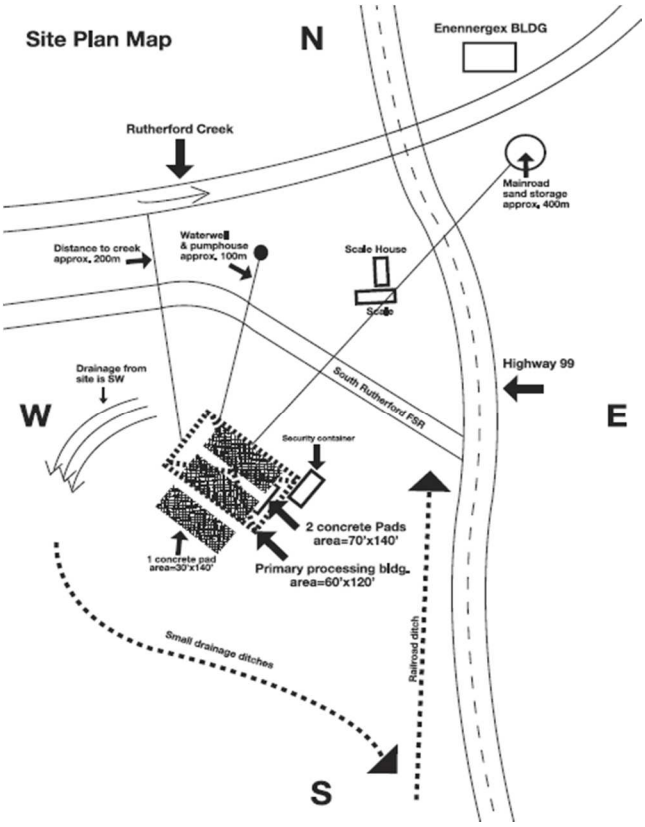
WasteWise.

This establishment proudly recycles organic waste in support of farming and local organic food production.

Every community will experience its own unique challenges and these are magnified in smaller population centers as they struggle with the capital costs associated with moving forward with organic recycling. In some cases the waste can be hauled to a larger processing facility located nearby, but in many cases it is simply too expensive or far a distance to make the effort. In British Columbia, other than Vancouver and a couple other medium sized municipalities there is a large population dispersed among smaller communities with less than 100,000 residents. We have worked to develop a Modular Composting (MC) solution which specializes in processing smaller design capacities ranging from 2,500 TPA to 20,000 TPA. It comes with its own diesel power system making it ideal for remote locations where power is not readily available. The design was developed to remove un-recoverable costs associated with in-ground

infrastructure which are often difficult to finance and are typically lost when relocation or design modification and expansion is required. The MC is an economical first step in the development of a new processing program at a fraction of what would typically be required for facility construction.

Through support from the OSDP, we have worked to develop a certified organic soil which had to start with the construction of a facility and sufficient infrastructure to obtain the necessary permits and provincial approvals (design / site plans / zoning / Solid Waste Management Plan) so as to move forward on a sustainable scale. By developing a MC solution, we will be able to show how a singular piece of equipment is delivered to the site which is entirely self-contained and can be relocated if necessary in a matter of minutes. We are able to operate this system exclusively through Generator power while consuming less than 1 liter of diesel fuel per hour while processing up to 5,000TPA of organic wastes. The system data logs all necessary regulatory temperature and operating criteria and controls all internal power systems so as to optimize fuel and power utilization. The MC provides self-contained fuel storage (for up to 2-4 weeks of unattended operation), secure and safe storage of all equipment as well as an office for staff and field personnel who visit the site for operations. The unit comes pre-wired and provides a completely commissioned compost facility at the push of a button further limiting risks associated with in the field construction and start-up.



While there are many ideal applications for this equipment, one which has proven a good fit, is for composting sites which are considered for operation on a brownfield location where power is not available. This can consist of a landfill or in the situation in Pemberton of a decommissioned gravel pit and concrete batch plant. While landfills typically come complete with their own leachate catchment and containment system, in Pemberton, our facility came complete with a scale and some basic concrete pads which we have re-used to avoid capital costs as best as possible. While a lot of effort has been made to clean –up and rehabilitate the site, the most significant

improvements were completed with private funding and include bear fencing, a large covered structure/building and new paving and leachate controls.

Once we completed the necessary improvements on site we immediately moved forward with the production of compost and the recycling of the regions food waste. This has been a slow process however as the food waste takes time to secure and the permitting process has been more onerous than expected. We are happy to report that we now have the appropriate zoning for composting at our location, along with the necessary approvals from the City of Pemberton and the Ministry of the Environment (representing the Province). Recently we also have received approval via the regional (Squamish Lillooet Regional District) solid waste management plan which has written us into their documentation as an approved organics processing facility and we are now receiving all food waste generated within the region and hope to soon commence with processing of organics from North and West Vancouver.

Now we are producing a Class "A" Compost which is being incorporated into local soils and gardens. We complete regular testing of our soils and this spring (March / April 2014) will be our first year with a substantially sized (cured) stockpile of compost available to sell to the local market. We are now happy to report that we are using this manufactured compost to complete growth trials with a couple of different compost recipes. We are using locally sourced amendments including sand from our own site (gravel pit) which will amend our compost into the most complete soil product possible. These trials are expected to be completed by the end of February of 2014 and we have shown / included as much as is available at this time in the following report. We plan to highlight the results of the soil that we have been manufacturing using our modular design and will showcase results from our indoor growth trials by the end of February of 2014 (following 10 – 14 weeks of growth comparisons). Outdoor farming trials will commence in the spring of 2014 with seedlings planted indoors in Feb/March and outdoor application of our compost to a farming plot with comparisons against the baseline in April and May. The test results have now been collected (please reference the results section of this report) and we are confident that our weed free / nutrient rich compost will be well received by the market. The introduction of any new amendment will take time to be adopted on a wide scale across the farming community; however with the results of our own studies funded (in part) through support of the OSDP program, we will soon be able to demonstrate an improvement in production of the organic farming sector for this region. Our results which will be replicable in other communities which face similar challenges across the Province and we look forward to sharing our knowledge with others to advance the production of high quality locally produced food.

INTRODUCTION:

Following the development of the composting infrastructure which is outlined in the site preparation section of the report, trials were conducted with various controlled feedstocks so as to study and commission the system prior to permitting and full acceptance of the regions food waste on a more permanent basis.



From Left to right you can see the various amendments we used for composting. We obtained chicken manure from farms in the Fraser Valley and combined this with various local wood wastes (fir and cedar) and studied the temperatures that were obtained and the resulting composition of the compost. We then compared this end product with a compost that was manufactured only from green and food waste (from Whistler restaurants).

While both composts proved to be high in nutrients, replicating the results consistently and sustainably meant that the food waste was needed as the primary nitrogen source for the composting process. Agricultural manures were simply too expensive to haul all the way to our Rutherford site location, even once a suitable back haul was discovered. Every truckload of agricultural waste material hauled from the Fraser Valley to be used as a Nitrogen source cost more than $1,200 so as to transport approximately 30 tonnes. Even assuming that a backhaul of carbon to the Fraser Valley for incineration in a local greenhouse could be possible on a regular basis, our research showed that only $400 ($20/unit) would be paid for a full walking floor and extra costs were added for an additional load/unload making this option unsustainable.

Following the construction of the modular composter, the obtaining of all necessary approvals and the preliminary production of compost and commissioning of the system, we have commenced with regular day to day site operations. We are now producing a consistent and sustainable food waste compost from the facility which was used in the below study. It is our intent to determine what recipe of locally available materials will best optimize the performance of the engineered soil we plan to sell by the bag for retail purposes. The bulk compost will be implemented in farms in the spring of 2014 as we have not

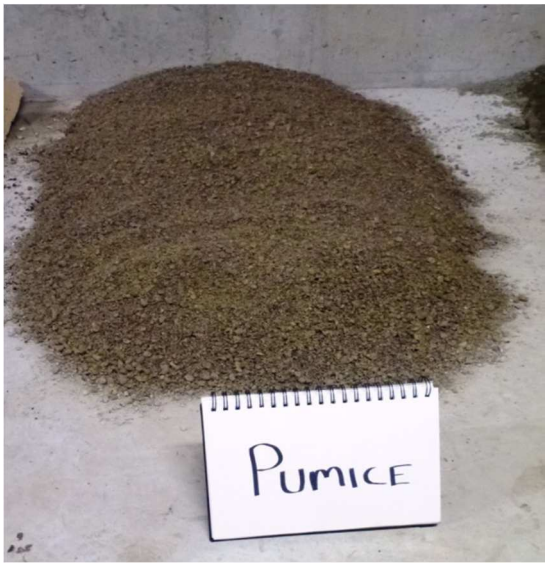
had sufficient stockpiles to complete in field trials until now. We look forward to sharing our results in the weeks ahead.

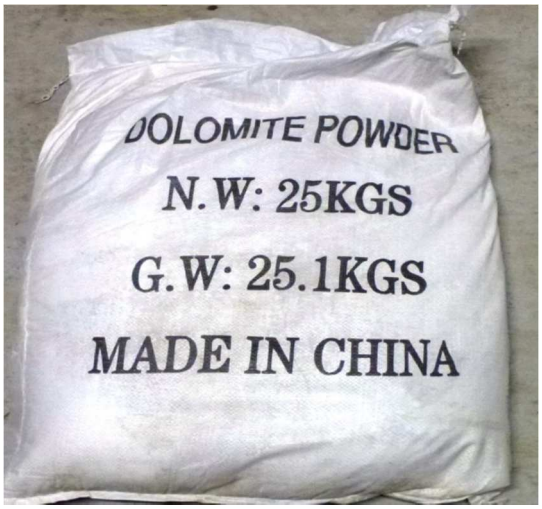
MATERIALS AND METHODS

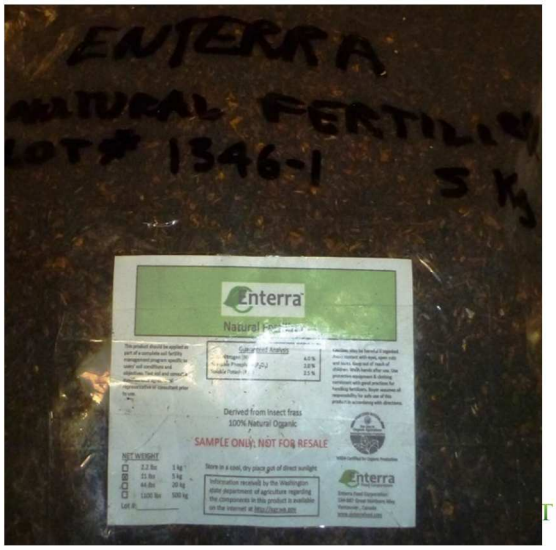
In order to gauge the effectiveness of our soil, we needed to establish a baseline comparison against the top products on the market which are currently used in retail bagged soil sales. The large bags of Pro-Mix and Sunshine Mix #4 are the top sellers and these products were tested against our soil blends. These commercial bags are primarily a mixture of peat, perlite and vermiculite. They sell volume bags of this product which is quite low cost on a per liter basis with a large 107 liter bag.

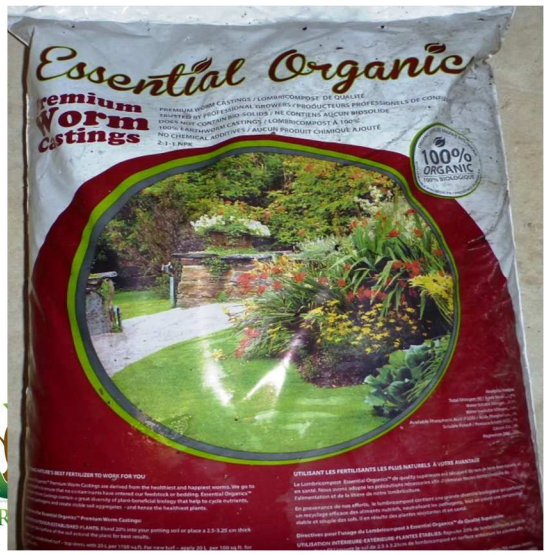
The compost that we manufactured with agricultural amendments was tested against the compost manufactured from food waste so as to see if any differences were identifiable between the two completed blends. Test results indicated that these two composts were very similar in composition and held similar quantities of soil nutrients. The following base ingredients were mixed and used in the comparison bio-assay against the baseline.

The below amendments were used in the soil mix recipes outlined at the end of this section:









Once the various recipes were mixed and weighed, 7 samples were developed for each mix so that an accurate average could be determined and trends associated with the various mixes analyzed. A controlled growing environment was utilized for the testing with uniform lighting applied to all plants. Clones were utilized so that all plants were provided the same genetic benefits for growing

The mix recipes that were utilized are outlined below. Growth trials were commenced at the start of December 2013 and will continue for a total of 10 weeks. Results will be shared with the OSDP program once they are available.

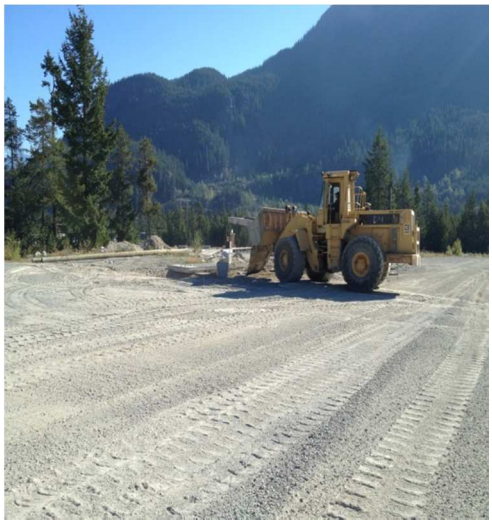
Mix #1	Mix #2	Mix #3	Mix #4	Mix #5	Mix #6
50% Compost A 45% Sand 5% Enterra Fertilizer	50% Compost B 45% Sand 5% Enterra Fertilizer	50% Compost A 30% Peat 20% Pumice	50% Compost B 20% Worm Compost 30% Pumice	Sunshine Mix #4	Pro Mix HP

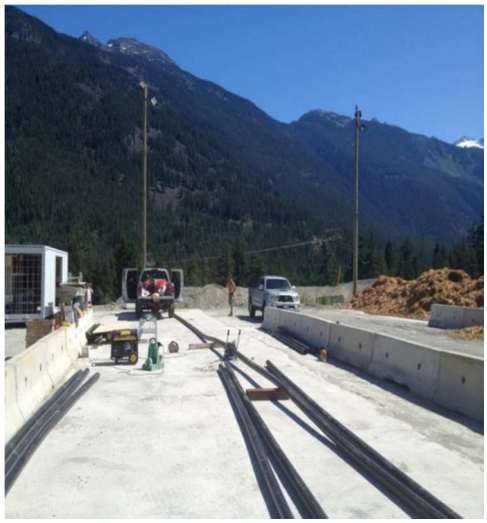
REACHEARCH SITE AND PREPARATION:

The development of the compost facility started with the purchase and retro-fitting of a C Container by insulating the interior and by separating it into two different areas. One side of the container was designed to be utilized as an office and data storage work center. The other side of the container was designed to be used as a fuel storage and processing area. This is where the blowers, controllers, UPS, and battery are stored. This modular composting solution is what allowed us to convert an abandoned brownfield site without power or utilities into an operating and permitted composting facility.

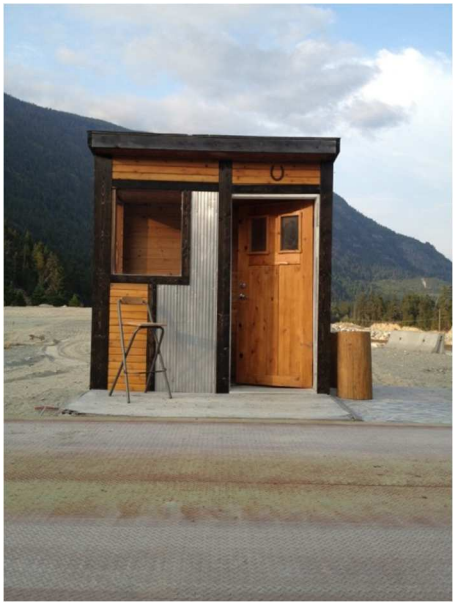
Once the C container was completed and we had the ability to provide power to the piles we constructed an HDPE fusion welded aeration system which we connected to the blowers using a flexible duct pipe. While we evaluated the feasibility of implementing solar power photovoltaic cells to the roof of the container it was determined that we would only be able to store approximately 2 hours of operating time through a battery system which also proved to be beyond our budget in capital cost.

The site was graded using our equipment and the existing concrete pads were cleaned and lined with abandoned Jersey barriers so as to aid in containing the organic matter. These pads have now been re-tasked for curing and storage of finished Class A compost as the primary composting operation has been re-located into the main processing building.





The scale wiring was replaced and scale house shack was re-constructed so that it could be re-used for weighing incoming loads of organic waste that required processing (below left). There is currently no power at the scale (or anywhere else on the site) so a generator connection and controls were required. Struggles were encountered with rats chewing on our wiring so vector controls were required. The pump house (below right) was also constructed and improved so that water could be provided to the primary composting operation year round. This required us to bury a water line and to install water storage suitable to provide enough water to get the incoming compost to at least 60% moisture content.



TEST RESULTS / DATA COLLECTED

Below is a sample of data collected from the Pacific Soils Analysis Inc. lab in Vancouver BC for compost produced at our facility. This lab and others have tested various samples of our soil with a consistent demonstration of zero fecal coliforms or pathogens (Salmonella test) contained within the end product.

PSAI August 23, 2013

Sea to Sky Soils

Sample	pH	Est E.C. mmhos cm	Lime Rqmt lbs 1000 sq ft	> 2mm %	< 2mm %	Sands %	Fines %	Total O.M. %	Total N %	C/N	Bray Avail P ppm	Avail K ppm	Avail Ca ppm	Avail Mg ppm	Avail Na ppm
Soil Mix	6.9	2.8		19.3	80.7	30.7	20.3	49.0	1.65	14.9	3308	5667	6000	1417	985
	✓	✓		woody organics											

1. This compost has a good starting point for soil pH, salt reading (EC) and sodium (Na). The sodium is high and will need to be leached out before planting.
2. The fertility status is good. It is high as expected in a compost, but it is balanced.

Nutrient Legend VL= Very Low L= Low M= Moderate ✓ = Adequate SH= Slightly High H= High

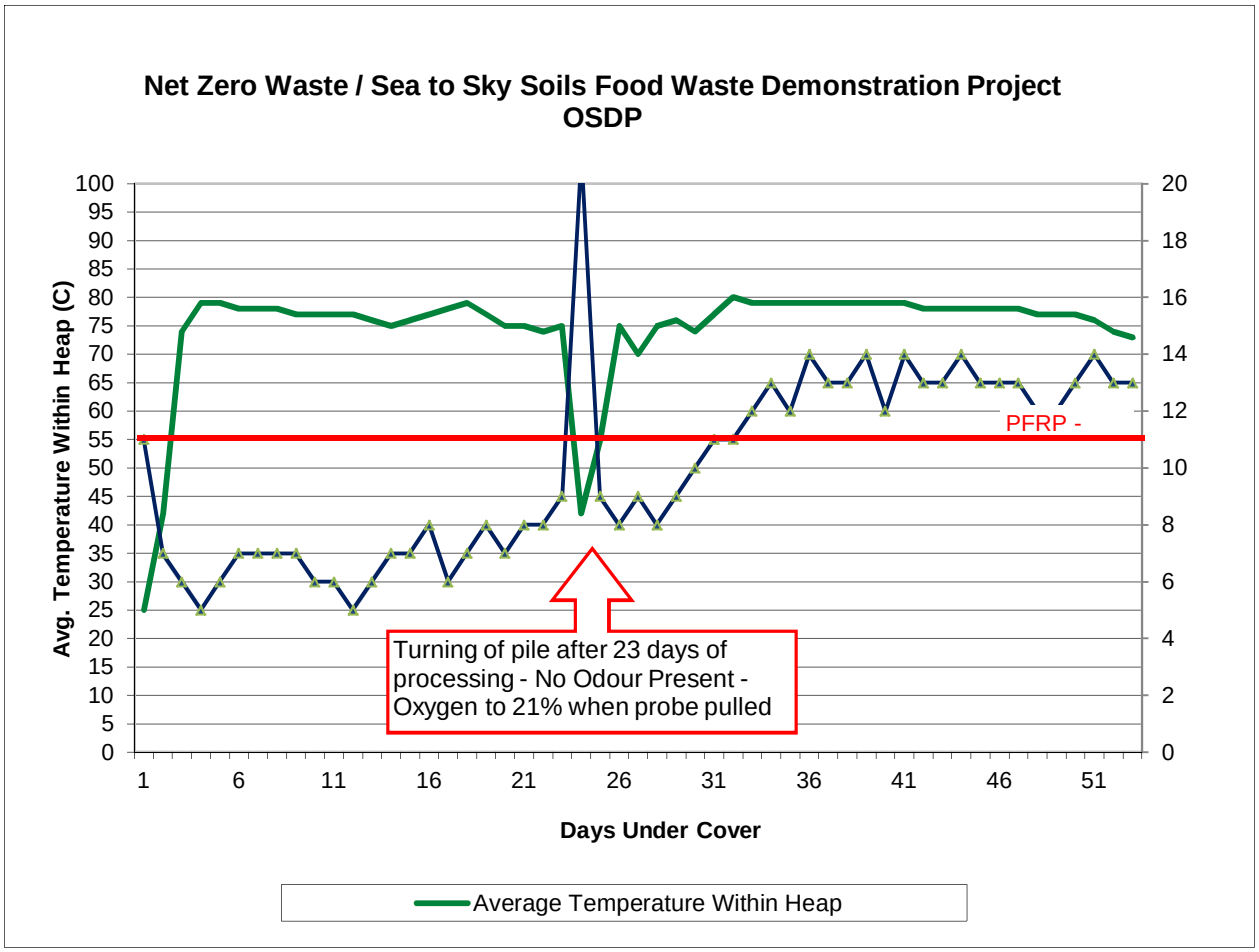
Unit # 5 - 11720 Voyageur Way, Richmond, B. C. V6X 3G9 604-273-8226 B Wilkinson

Sample received August 21, 2013

While it has proven challenging to get our soils implemented in our target market (certified organic farming applications) this will become easier to break into once we obtain our certification from OMRI as an allowable soil amendment for certified organic growers. While we have applied to have our soil registered with OMRI (the Organic Material Review Institute) this process takes between 6-8 months. We are in the process of demonstrating our soil as an in-situ amendment for local, nutrient poor farms. By transporting the compost directly to the field as a top dress, the farmer will see immediate benefits on that growing season. This has been demonstrated in

many other markets around the world. We intend to demonstrate that compost utilization will provide savings in the cost of fertilizer and disease suppression benefits. This work is already underway and we hope to be ready to sell to our first customers in the spring of 2014.

While we continue to progress with the testing and marketing of our soil end product, we look to expand into other markets in the year ahead. Our food waste compost has already been utilized in a sports field and thanks to the heat and duration of our composting process (reference sample data from our food waste composting process below), we can demonstrate a 100% weed seed free soil product ideal for sports fields or golf courses. It will take time to demonstrate and grow into this and other markets such as the bagged compost and home gardening segment however we are confident that this will happen naturally in the years ahead.



NET ZERO WASTE