RECYCLING TECHNICAL ASSISTANCE
Project #558

FINAL REPORT

BETHLEHEM TOWNSHIP
NORTHAMPTON COUNTY, PENNSYLVANIA

YARD WASTE FACILITY EXPANSION AND CURBSIDE SOLID WASTE COLLECTION CONTRACT EVALUATION

SEPTEMBER 2014

Sponsored by the Pennsylvania Department of Environmental Protection through the Pennsylvania State Association of Township Supervisors

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Project Completed By:

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1.0 STATEMENT OF PROBLEM

This municipal recycling study was conducted for Bethlehem Township (Township), Northampton County, Pennsylvania, under the Recycling Technical Assistance program. The program is sponsored by the Pennsylvania Department of Environmental Protection (PADEP) through the Pennsylvania State Association of Township Supervisors (PSATS). The Township requested assistance to determine if its yard waste recycling facility can be expanded to accept Act 101 container recyclables, cardboard, and other grades of paper. The Township wants to know the feasibility of including drop-off recycling services as part of a municipal-wide bid to secure a single hauling company for curbside municipal solid waste and recycling services. The Township also requested recommendations regarding a Pay-As-You-Throw (PAYT) solid waste program.

2.0 SUMMARY OF WORK

2.1 Background Information

In accordance with the Municipal Waste Planning, Recycling and Waste Reduction Act of July 1988 (Act 101 of 1988), the Township is required to offer a curbside recycling program to residential establishments. Approximately 9,300 households receive curbside trash and recycling services through private subscription service with local solid waste hauling companies. Historically, there has been resistance by some residents regarding the elimination of the current private subscription service provided by various waste hauling companies.

2.2 Existing Curbside Solid Waste and Recycling Services

Over 10 different solid waste hauling companies operate within the Township. Curbside solid waste and recycling services vary substantially depending on the hauler providing the service and the services selected by each participating household. Household trash is typically collected weekly, but sometimes collected twice per week. Recyclables are collected either once a week or every two weeks. The Township provides each residence with one 20-gallon recycling container. Acceptable residential curbside recyclables are specified via Township Ordinance No. 02-09 and include clear and colored glass, newspaper, corrugated paper, high-grade office paper, telephone books, aluminum cans, steel cans, bimetallic cans, # 1 PET plastics, # 2 HDPE plastics, and leaf and yard waste. According to several Pennsylvania hauling companies, the number of households that do not subscribe for curbside trash collection service in private subscription systems ranges between 10 and 20 percent.

2.3 Existing Leaf and Yard Waste Program

Private haulers operating within the Township are required via ordinance to collect leaf waste and yard waste at the curbside once in May and once in November. The Township provides seasonal collection of leaves only using leaf vacuum trucks. Leaves are composted at local compost sites in cooperation with Koehler Farms. Woody yard wastes are staged temporarily and processed using a grinder. Ground yard waste is hauled offsite to a local landscaper for reprocessing.

2.3.1 Bethlehem Township Recycling Center

Curbside organics collection is supplemented by the Bethlehem Township Recycling Center (Recycling Center). The Township collected nearly 14,000 cubic yards of organic material in 2013 through its curbside and drop-off programs. The Recycling Center is open to the public 20 hours per week. The 4.7-acre Recycling Center sits adjacent to the Public Works Department Garage on Falmer Drive (**Figure 1**). The Recycling Center is primarily used to process residential woody yard waste that is dropped off by Township residents. **Table 1** and **Table 2** summarize operations and costs. The annual operating cost of the Recycling Center is $31,000. Residential yard waste is ground into mulch or wood chips at least once per month. Composted leaf mulch and wood chips are staged in bays for residents to self-load. Most compost is delivered to a local landscaping company in Township dump trucks to be processed, reground, colorized, and reused. Leaves and grass are not accepted at the Recycling Center.

Figure 1. Bethlehem Township Recycling Center

Table 1. Summary of Recycling Center Operations	
Item	**Detail**
Facility size	4.7 acres (2 acres paved)
Staff, part-time	2
Tub grinder (1)	Duratech Industrial
Backhoe (1)	John Deere
Loader (1)	John Deere
Dump trucks (3)	Haul processed organics and other materials
Grinding frequency if conditions allow	Twice per month
Materials ground in 2013	8,054 cubic yards
Leaf collection in 2013	5,850 cubic yards
Accepted materials	Tree trimmings, shrubbery trimmings, Christmas trees, logs up to 12" in diameter, clean stumps, flower plants, potted plants without dirt, vegetable plants. Grass is prohibited.

Table 2. Recycling Center Operational Costs	
Item	**Cost ($)**
Wages (part-time)	20,000
Benefits (FICA ER share)	1,530
Service for equipment (tub grinder, etc.)	5,000
Supplies for equipment (tub grinder, etc.)	3,000
Utilities (electricity, port-a-potty, etc.)	1,500
Total	**31,030**

2.3.2 Recycling Center Site visit

Gannett Fleming visited the Recycling Center June 11, 2014. Recycling Center observations and items noted by the Public Works Director are included in Section 3.0, Summary of Findings.

3.0 SUMMARY OF FINDINGS

3.1 Curbside Municipal Solid Waste and Recycling Program

There is an opportunity to substantially improve the operational performance and sustainability of Bethlehem Township's residential curbside municipal solid waste and recyclables collection program. In part, this opportunity exists because the operation of different waste hauling companies and many waste collection trucks within the Township results in collection route overlap and service inconsistencies. When ten hauling companies operate year round in the Township there are cumulative economic, social, and environmental impacts. Collection inefficiencies increase labor, operating costs, and collection-related impacts. Service inconsistency decreases recycling participation and material recovery. These inefficiencies have direct cost impacts (e.g. elevated trash bills) and indirect cost impacts (e.g. taxes for roadway maintenance). As the number of garbage trucks increase, so does natural resource consumption and emissions along with impacts to community aesthetics and safety (See **Appendix A**, **Memo, Multi hauler System Impacts/Considerations, August 2014**). Key considerations regarding the multi-hauler solid waste system operation within the Township include:

- Based on conversations with several waste hauling companies, on average 10 to 20 percent of occupied household units in Pennsylvania municipalities with private subscription service do not subscribe for waste collection services. Non-subscribers share service with neighbors, use commercial dumpsters, or illegally dispose of trash and recyclables. Non-subscribers indirectly increase the costs for paying customers because the waste generated by non-paying customers still requires hauling and disposal and these costs are factored into the price for paying customers.

- Gannett Fleming performed a preliminary analysis of Bethlehem Township's residential recycling to compare baseline or current recycling and disposed municipal solid waste (MSW) with the Township's potential residential diversion. As seen in **Table** 1, reported curbside recyclables (excluding organics) only represent 5 percent of the total waste generated in the Township. Curbside recycling is well below the 20 to 25 percent curbside diversion rates that can be achieved. **Table 2** represents the potential residential diversion by material assuming the total material quantity (18,968) is the same as the baseline. The potential residential diversion shows how the distribution of the disposed MSW, curbside recyclables, and organics might look in the Township with a comprehensive curbside solid waste management program.

Table 1 - Bethlehem Township
Residential Baseline Material Quantities

Material	Tons	Percent of Total
MSW Disposed[1]	14,411	76%
Curbside Recycling (non-organics)[2]	916	5%
Organics (vacuumed leaves and mulch)[3]	3,641	19%
Total Materials	**18,968**	**100%**

Notes: 1.) EPA's 4.38 pounds per capita per day x's population minus reported residential recycling.
2.) The average of 2011, 2012, 2013 curbside recyclables.
3.) Year 2013 reported leaf collection and yard waste volumes converted to tons.

Table 2 - Bethlehem Township
Potential Residential Diversion by Material[1]

Material	Tons	Percent of Total
MSW Disposed	9,484	50%
Curbside Recycling (non-organics)	4,742	25%
Organics (vacuumed leaves and mulch)	4,742	25%
Total Materials	**18,968**	**100%**

Notes: 1.) Potential diversion represents achievable diversion rates demonstrated by successful curbside solid waste programs.

- According to the Pennsylvania Department of Transportation, Bethlehem Township has 110.31 miles of Township roadway and 27.20 miles of State roadway. Based on calculations and analysis related to traffic loading impacts by the American Association of State Highway and Transportation Officials (AASHTO), garbage trucks have the greatest impact to Township roadways compared to any other vehicle, with the exception of buses along repeatedly travelled transit routes. Traffic load impacts are

measured by the weight applied to pavement structures and the frequency the weight is applied, or the axel load accumulation. Roadway loading impacts are non-linear. For example, doubling the load weight of the same trash truck inflicts approximately sixteen times the damage to the pavement structure. For comparison, a passenger car's equivalent single axle load (ESAL) is .0004 and a full garbage truck's ESAL ranges from 3.37 to 5.48. An ESAL is represented as an 18,000 pound single axel load. Passenger vehicles are assumed to have no impact to a typical 20 year roadway design but garbage trucks are a major factor in the life of Township streets.

- The municipal bidding process to secure a single waste hauling company to provide comprehensive curbside solid waste collection and disposal services is an extremely effective method for streamlining and improving Township-wide solid waste system performance.

- There is a common misconception that competition among multiple waste hauling companies results in lower trash bills for individual customers. Trash bills from municipalities throughout Pennsylvania show that the average trash bill in municipally operated collection programs and in single-hauler contract collection programs ranges from 15 to 35 percent lower than multi-hauler programs. Gannett Fleming conducted a preliminary analysis using year 2014 trash bills from Bethlehem Township customers and data from nearby municipalities with contracted solid waste collection programs. The analysis assumes 9,300 households have service now, and 9,300 households would have service under a curbside collection contract for solid waste and recyclables. As shown in **Chart 1**, Bethlehem Township households pay $468 now. Under a moderate scenario for a single hauler, residential households under a contract program would pay $320 for comprehensive waste and recycling services. This is a savings of nearly $150 per year, per household. **Chart 2** presents the moderate scenario comparing the total current multi-hauler costs (trash bills) for all households over a 3-year period or contract term with the estimated contract cost for all households. The current sample cost (higher end) is $13,057,200. The estimated contract cost (lower end) is $8,928,000 producing an estimated savings of $4,129,200 over 3 years. Gannett Fleming notes that the current trash bill pricing varies widely, but exceeds $460 per year for some customers. The contracted cost that is presented is an estimate that will be influenced by the level of service, market conditions, bid structure, and other factors. The analysis presents a realistic average trash bill under a contract program and the expected savings for individual paying customers and the Township over a 3-5 year contract period.

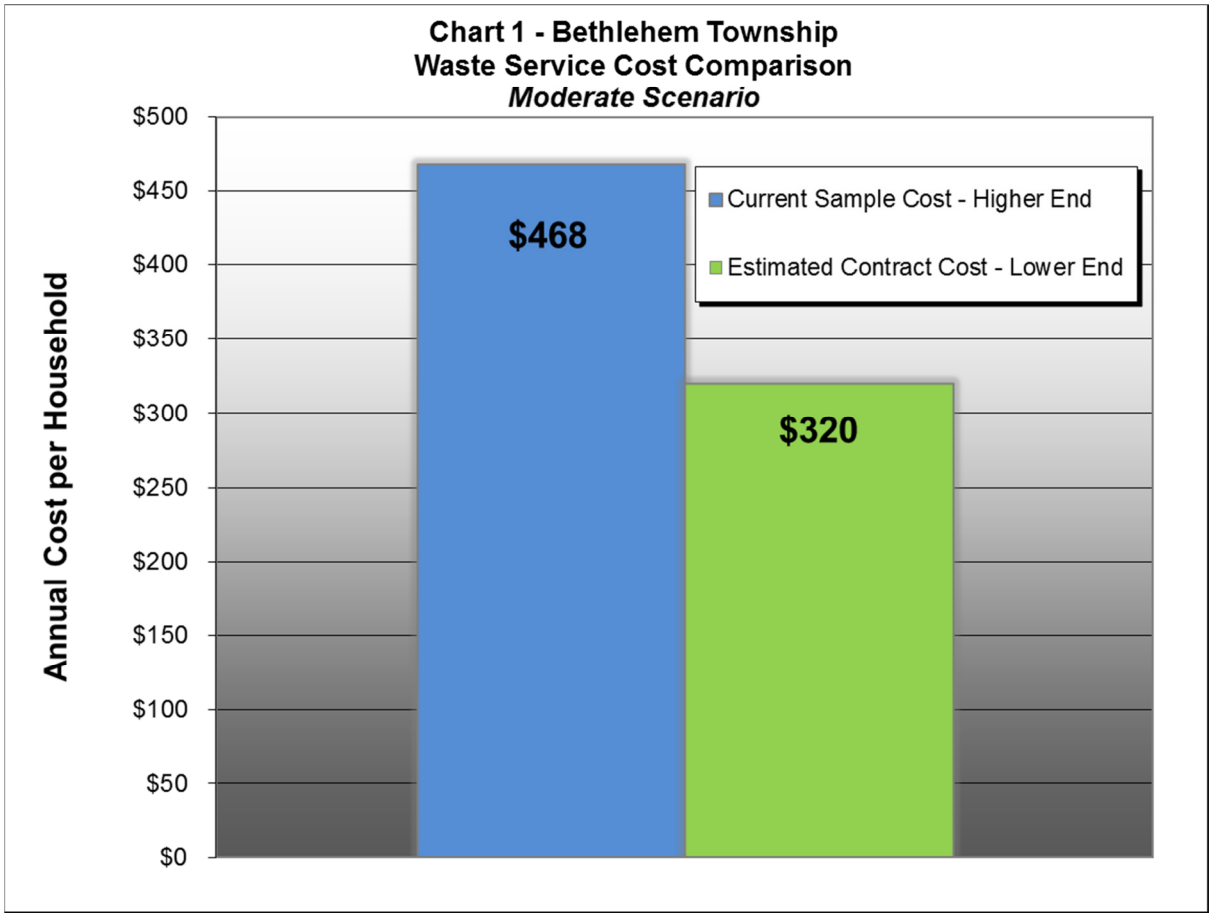


Chart 1 - Bethlehem Township
Waste Service Cost Comparison
Moderate Scenario
Annual Cost per Household
$500
$450
$400
$350
$300
$250
$200
$150
$100
$50
$0
$468
$320
Current Sample Cost - Higher End
Estimated Contract Cost - Lower End

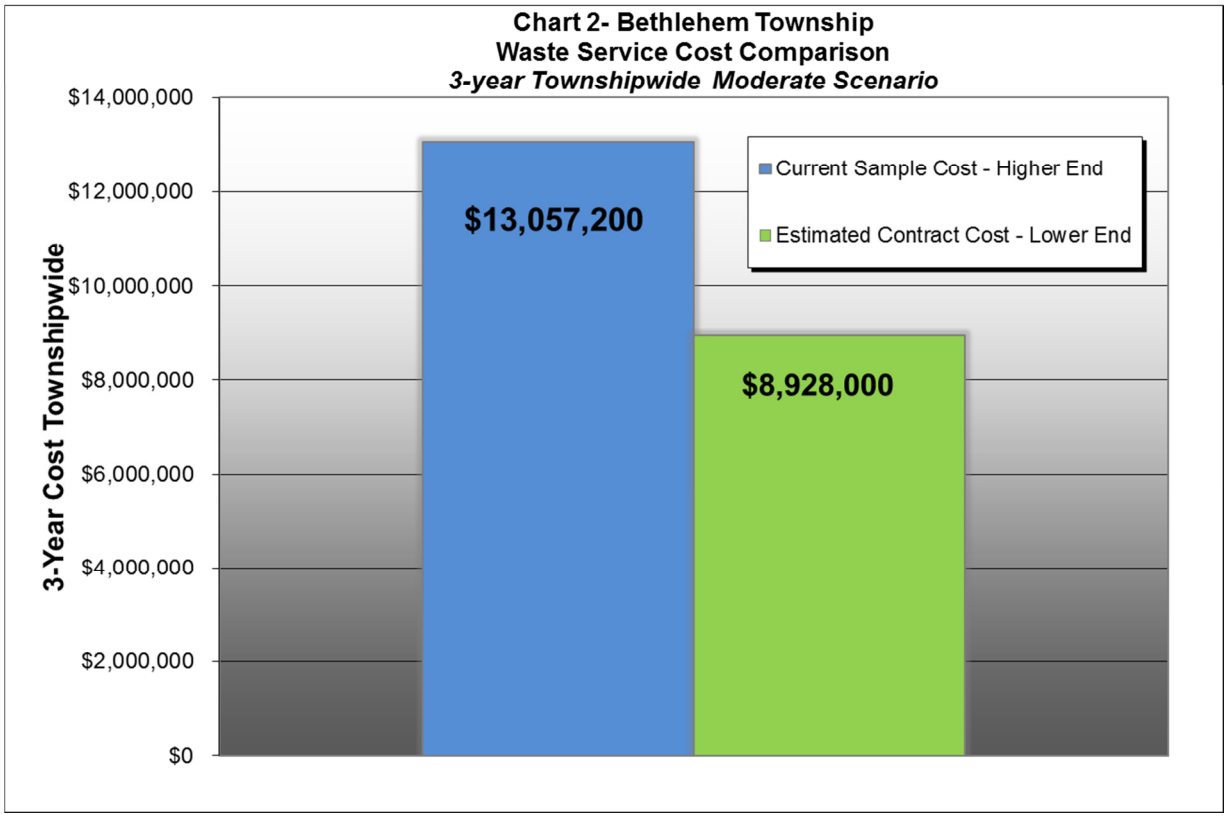


Chart 2- Bethlehem Township
Waste Service Cost Comparison
3-year Townshipwide Moderate Scenario
3-Year Cost Townshipwide
$14,000,000
$12,000,000
$10,000,000
$8,000,000
$6,000,000
$4,000,000
$2,000,000
$0
$13,057,200
$8,928,000
Current Sample Cost - Higher End
Estimated Contract Cost - Lower End

3.2 Recycling Center (Yard Waste Drop-off Facility)

The yard waste site operation, configuration, and leachate collection system are well organized, clean, and in good working condition. The site is gated and includes a small covered shed for part-time staff to greet visitors and record visitor data as they arrive. Based on initial observations, the Recycling Center appears adequate to accept additional visitors and materials, including the proposed single stream materials and cardboard. Significant quantities of processed organics are given away to a local private landscaping company. Giving away a marketable organics that could generate revenue is not economically preferable considering organics processing costs are incurred by the Township and paid for by residents. A number of local residents have expressed interest and the need for the Recycling Center to be open more and at different times. Based on Gannett Fleming's observation of other compost facilities, the limited operation of the Recycling Center on weekdays from 12pm to 4pm substantially reduces residential participation and material recovery.

3.3 Pay-As-You-Throw (PAYT)

Residential PAYT is a proven municipal solid waste program structure with the potential to yield very high waste diversion or recycling rates. High waste diversion can be partially attributed to the financial incentive built into the PAYT. Since customers pay based on the volume of trash they place at the curb, many are empowered to lower their trash bill through waste reduction. This financial incentive motivates customers to reduce waste disposal through recycling while also reducing the total amount of waste generated through reuse and other practices. Compared to other standard residential solid waste collection programs, PAYT programs are administratively complex to implement. For example, in a bag PAYT program the responsibility of buying PAYT trash bags is on the residents. The Township would be responsible for setting the cost per bag (e.g. $2.50 to $4.50 per bag) to cover program costs and to assure residents have convenient locations to buy bags. Additionally, PAYT programs must be supplemented with effective and convenient waste reduction, reuse, and diversion options (e.g. organics, electronics, and household hazardous waste programs) so residents can lower their trash bill without resorting to illegal or nuisance disposal practices.

4.0 SOLUTIONS

4.1 Conclusions and Recommended Solutions

Bethlehem Township effectively operates a Recycling Center for yard waste processing that has the capacity to handle additional visitors and materials. There is interest by the Township and residents to expand Recycling Center services and operating hours. The Township's reported curbside recyclables diversion, excluding organics, is 5 percent. This curbside recycling rate is far below the Township's potential diversion rate and other successful curbside programs. Increasing curbside recycling will increase recycling revenues awarded to the Township through the Act 101 Section 904 Performance Grant program. Although no single hauling company can be blamed for curbside program deficiencies, the overlapping operations of hauling companies and numerous trash trucks contributes to inefficient waste and recyclables collection. Contract collection with a single hauling company is an alternative to the existing waste collection program. A contractually based single-hauler collection program can eliminate truck route overlap and curbside waste and recycling program inconsistencies. Streamlining residential curbside solid waste collection will decrease the average trash bill and decrease truck traffic and the associated noise, roadway damage, and toxic emissions. The bidding process for

curbside solid waste services can also be leveraged to obtain cost competitive pricing for services that can enhance the services available at the Recycling Center.

Because changing residential solid waste collection structures is a complex issue with public and political implications, it is important the Township collect and carefully evaluate data on its alternatives and compare this with existing program performance and cost data before making a decision regarding its residential curbside solid waste collection and disposal program. Data collection and analysis should be completed internally before holding public meetings on this sensitive issue so that elected officials and other decision makers clearly understand the information and issues. Based on Gannett Fleming's evaluation of the current solid waste program it is recommended the Township take the following approach to implement solutions:

- To obtain the data needed to evaluate and compare curbside collection services and costs including potential recyclables revenue from area waste contractors, prepare and release a Request for Bids (RFB) for Township wide residential curbside collection and recycling services that could result in a contract with a single qualified waste contractor.
    - Include language to "reject any and all bids" so the Township retains the choice to continue its private subscription multi-hauler program if desired.
- It is recommended that during the RFB development process, a vision be established for a sustainable curbside program that delivers comprehensive services to all residential units, including other beneficial services like enhanced Recycling Center services.
- The RFB should be structured to bundle core services together into the "base bid". Correctly bundling services promotes competitive pricing for each desired service component. The Township's base bid or core service components should include:
    - Once per week curbside trash collection.
        - Allow the waste hauler to establish collection zones as needed to promote efficient collection routes (e.g. zone 1 is Monday collection and zone 2 is Tuesday collection)
    - Once per week single stream recyclables collection on the same day as trash.
        - Include procurement and amortization of 64 gallon and 96 gallon recycling carts over the contract period. The Township will own containers after the contract term.
    - Twice per month curbside collection of "leaf waste", April through November, as defined as consisting of leaves, garden residues, shrubbery and tree trimmings, and other similar materials but excluding grass. Tree trimmings should be bundled, and not to exceed 4' length and 6" in diameter. These added organics services supplement leaf collection, support additional waste diversion, and can increase Act 101 Section 904 Grant awards to the Township.
    - Collection of one bulky item per week per residential unit. Bulky items include items like chairs and furniture but do not include electronics, which are prohibited from disposal with regular trash. This collection structure allows the contracted hauler to collect these items on the same truck and route as regular trash. This saves time and money and reduces the number of trucks on Township streets.
    - Solid waste billing should be performed by the Township and integrated with the quarterly billing process for sewer.
- It is recommended the RFB include the following Recycling Center services:
    - Staging of 2, 8 cubic yard dumpsters to collect single stream recyclables that would be dropped off by Township residents.
        - On-call service to pick up full containers and replace with empties.

- If the Township is able to add 3-phase power to the Recycling Center to support the operation of a cardboard (or mixed paper) compactor, the RFB should request pricing for servicing the compactor (on-call pulling the full compactor and replacing with an empty). A compactor is recommended for cardboard because it is more economically feasible when compared with the hauling services for loose cardboard. At current cardboard commodity pricing of $70 to $100 per ton, the revenue from sale of compacted cardboard should offset compactor service costs. The Township can rent a compactor from the contracted waste hauler or buy a new or used compactor. New compactors are available through Pennsylvania's General Services COSTARS program: http://www.costars.state.pa.us (See **Appendix B**, Costars Compactor Suppliers). Both new and used compactors are eligible for up to 90% reimbursement of eligible costs through the Act 101, Section 902 Grant Program.
    - Adding 3-phase power to the Recycling Center is eligible for Act 101, Section 902 Grant funding and typically costs $8,000 to $15,000.

- The Township should consider increasing the operating hours of the Recycling Center.
  - Increase operating hours, particularly during weekdays from 4pm to 6pm. Increase operating hours gradually because this will increase participation and also the labor and operating costs to receive and process additional material.
  - Add an automated keycard gate system to allow access to residents who have obtained a keycard from the Township. This would allow the facility to be open without staff, but under control. This system generates a usage log and rates for cards could be higher for local landscapers as a revenue source. A cost quote from Parking Products, Inc. for the gate system and 1,000 access cards ($7,595 total) is provided in **Appendix C**.
  - In the future, consideration should be given to let residents from another municipality use the Recycling Center. These hours can be restricted initially, to prevent overwhelming the facility with visitors and material. Opening the Recycling Center to other municipalities will improve opportunities for Act 101, Section 902 grant funds since multi-municipal cooperation is favored by PADEP.
- Gannett Fleming does not recommend PAYT be evaluated in detail or considered at this time as an alternative solid waste collection program. It is Gannett Fleming's opinion that there is an excellent opportunity to deliver a quality residential solid waste collection program via a single hauler contract. PAYT will complicate the implementation process. Some residents will perceive PAYT to be inconvenient and this is likely to result in unwanted negative feedback that prevents implementation.
- It is recommended the Township stop giving away processed woody wastes to private entities. Process woody wastes can be placed temporarily in large piles away from the receiving and processing areas of the site. The material should be marketed and sold to generate revenue using any of the following methods:
  - Negotiate with local markets like landscaping companies, compost facilities, and construction companies to obtain fair pricing for processed organics.
  - Identify one or more brokers to market processed organics.
  - Release a short advertisement including the types and quantities of available (stockpiled) organics to solicit pricing from interested markets.
    - This could include on-call service to remove processed wood chips quickly to prevent unwanted accumulation of material.

APPENDIX

Appendix A – Memo_Multi-hauler System Impacts/Consideration_Aug 2014
Appendix B – PA General Services (Costars)_Compactor Suppliers
Appendix C – Keycard Gate Access Price Quote_Parking Services Inc.

Memo to Bethlehem Township – August 2014
Multi-hauler Residential Waste Collection Impacts/Considerations
By Steven Deasy, Gannett Fleming, Inc.

This memo addresses four concerns regarding the environmental impacts associated with the existing multiple hauler trash collection program in Bethlehem Township. Items are addressed in the context of evaluating an alternative: contractual collection of municipal solid waste and recyclables using a single waste hauling company. Single hauler waste service optimizes collection routes, assures adequate waste and recycling container capacity is provided to all participating units, and streamlines compliance with Act 101 requirements and PADEP recycling guidelines.

1- Subpar Recycling Performance.

Reasonably accurate recycling data is required to benchmark the Township's recycling program performance. Without accurate data it is difficult to calculate performance and environmental impacts. Lost recycling data can decrease Act 101, Section 904 performance grants paid to the Township, which are based on reported recycling tons. Funds from recycling grants applied to beneficial waste management programs (e.g. the yard waste facility) produce environmental benefits like increased waste diversion while allowing the Township to deliver these programs to residents at an affordable cost.

Recycling reports for Bethlehem Township are not accurate and reported curbside recycling is well below recovery rates achieved in successful curbside recycling programs. Incoming data from multiple hauling companies is often errant and incomplete. This can occur for several reasons but these errors occur because they are only rough volume estimates. Recycling trucks collecting in Bethlehem and other municipalities generate a load of mixed recyclables that originate from two or more municipalities where collection occurred. Haulers estimate how much of the total load originated from each municipality.

When compared with a single hauler contract collection, multi-hauler waste systems often result in a substantial portion of recyclable material that is disposed as waste because:

1 – Haulers provide a wide variety of recycling containers or rely on residents to provide recycling containers. Small containers or setting out multiple recycling containers can be inconvenient. Recycling container capacity and convenience has a direct impact on residential participation and on the quantity of recyclables recovered per household.

2 – Twice per week trash disposal is offered by some haulers. Excess disposal service and capacity increases collection costs and decreases recycling (Collection Efficiency, Strategies for Success, EPA 1999).

3 – Inconsistency among collection services combined with limited education outreach by some haulers contributes to program confusion, reduced participation, and contamination of recyclables.

4 – Between 10% and 20% of households do not subscribe for and do not pay for curbside trash service according to several PA waste hauling companies interviewed by phone. Households that do not subscribe for collection services are likely to improperly dispose recyclables along with waste, for example, in commercial dumpsters.

A single hauler contract will not result in perfect recycling data and some loads may still be estimated. However, data recovery and data accuracy will be substantially improved and can improve program benchmarking and is likely to increase recycling grants awarded to the Township.

2- Impact of multiple trucks on environment - emissions, noise, fuel, and road impacts.

Air Quality: Truck route optimization is not possible in the Township while multiple hauling companies operate within the municipal boundary. Total truck miles and travel time are greater when compared to a single hauler collection program that operates fewer trucks along well-planned collection routes. Single hauler routes collect houses consecutively without skipping residential units. Individual hauling companies in a multiple hauler system only collect each residential unit customer, requiring frequent service pass by's. Non-consecutive collection increases service time, fuel consumption, emissions, and roadway damage.

Diesel trash trucks get **3-4 miles per gallon**. The California Air Resources Board (CARB) identified 41 toxic constituents of diesel exhaust that threaten human health, some causing cancer. There are six criteria pollutants actively monitored by EPA (http://www.epa.gov/airquality/urbanair/) because of their threat to harm human health, the environment, and property. Criteria pollutants are produced during trash truck operation and include:

- **particulate matter**
- **ground-level ozone**
- **carbon monoxide**
- **sulfur oxides**
- **nitrogen oxides**
- **lead**

"**Fine particles**," such as those found in smoke and haze, are 2.5 micrometers in diameter and smaller. These particles can be directly emitted from sources such as forest fires, or they can form when gases emitted from power plants, industries and automobiles and trucks react in the air. Small particles less than10 micrometers in diameter pose the greatest problems. This Particle pollution contains microscopic solids or liquid droplets that enter the lungs and cause serious health problems. Scientific studies (www.epa.gov) link particle pollution exposure to a variety of problems, including:

- increased respiratory symptoms, such as irritation of the airways, coughing, or difficulty breathing, for example;
- decreased lung function;
- aggravated asthma;
- development of chronic bronchitis;
- irregular heartbeat;
- nonfatal heart attacks; and

- premature death in people with heart or lung disease.

According to the Journal of the American Medical Association, people living in urban polluted areas have a 12% higher risk of dying of lung cancer than people in the least polluted areas. That risk increases 50% for those regularly exposed to diesel exhaust, such as the workers who spend long days at the back of, or driving, garbage trucks.

Ground level ozone is produced from emissions from industrial facilities and electric utilities, motor vehicle exhaust, gasoline vapors, and chemical solvents are some of the major sources of NOx and VOC. Even relatively low levels of ozone cause adverse health effects. People with lung disease, children, older adults, and people who are active outdoors are particularly sensitive to ozone.

Water Quality: The environmental impacts from vehicle emissions are not limited to air quality. Polycyclic aromatic hydrocarbons (PAHs) are formed when gas, coal and oil are burned and eventually reach water bodies. PAHs are highest in areas with high rates of development and motor vehicle traffic. Air pollution from vehicles, industries, gas-powered lawn tools and similar sources contribute to nearly one-third of the total nitrogen load to the Chesapeake's waterways (www.chesapeakebay.net).

Roadway Damage: Damage to roadways by trucks is significant while damage to roadways by cars is negligible. There are increased costs, emissions, and environmental harms associated with increased paving activities that result from premature paving repairs accelerated by heavy truck traffic (Rough Roads Ahead, fix them now or pay for it later (AASHTO and TRIP, 2009) According to the American Association of State Highway Officials (AASHO) a typical 20 year road paving design surface includes these considerations and safety factors:

- Roadway damage caused by large trucks is exponential (x4). For example, doubling the load for a given axle increases the damage 16 times.
- For an equal number of applications (equal number of times travelled over a given road), heavier loads produce appreciably more damage to pavement than lighter loads.
- Using American Association of State Highway and Transportation Officials (AASHTO) vehicle load factors (VLF), a full, residential garbage truck is equivalent to **11,700 passenger** cars.
- The VLF of a passenger car (.0004) is so small that cumulative pavement impact is essentially moot. The impact of passenger vehicles to a roadway surface is not even considered during a 20 year pavement design. Large trucks and buses along with consideration of environmental impacts like freeze-thaw are primary design factors.
- Buses can have substantial impacts to road surfaces because travel frequency is combined with the VLF of buses.

3- Impact of curbside leaf and yard waste recycling - how much waste is diverted and why is this important?

In 2013, the Township yard waste facility received 8,054 cubic yards of yard waste (brush and similar material) that was ground into mulch along with 5,850 cubic yards of leaf waste collected at the curbside from residential units. According to the Pennsylvania Statewide Composition Study (2003), Table 5, Residential disposal to Landfill in a Suburban Sector is characterized as follows:

- Yard waste grass represents 2% of the disposed waste stream.
- Other yard wastes represent 2.4% of the disposed waste stream.
- Food waste represents 13.10% of the disposed waste stream.

Proper organics management is important because organics disposed in landfills generate methane, a potent greenhouse gas with 21 times the global warming potential of carbon dioxide. To eliminate environmental impacts from organics transportation and processing, Gannett Fleming recommends organic material management on site at the point of generation if feasible, like back yard composting. When composting and mulching on site is not possible, organics can be collected at the curb and/or supplemented by a yard waste facility. To reduce environmental impact from fuel based collection and processing, Gannett Fleming recommends curbside collections are provided seasonally in spring and fall periods, when the generated quantities of yard waste are highest. The Township has an effective leaf vacuum service and Recycling Center to process organics that are dropped off by residents.

Environmental benefits from organic mulching and composting stem from reduced environmental harms from avoiding the production, use, and transport of inorganic fertilizers (pollution generating activities). Inorganic fertilizers contain toxic chemicals and elevate nitrogen levels in surface water runoff and ultimately streams and water bodies. Inorganic fertilizer used in the Pennsylvania agriculture industry is a primary contributor to the destruction of the Chesapeake Bay estuary system. Additionally, mulch can reduce the demand for watering plants and reduces the use and impacts from mechanical/fueled equipment for managing weeds and grass where mulch is used.

4- Impact of Recycling- why is it important, what is its impact on landfill diversion?

Recycling produces direct environmental benefits. The amount of total energy and fuel expended to extract, transport, refine, produce, and deliver products from **raw materials** is substantially greater than recovery and reuse of recyclable materials. The amount of pollution produced in the recycling process is substantially less compared to making the same products from raw materials. Examples provided by Carbon Footprint include:

- Producing aluminum cans from recycled aluminum cans uses 1/12th the energy compared with making them from raw aluminum.
- For glass bottles, 315kg of CO2 is saved per ton of glass recycled.
- Making bags from recycled polythene uses 1/3 the Sulphur Dioxide and half the Nitrous Oxide compared to making plastic bags from raw materials.

Using EPA's per capita generation rates for recyclables for year 2010 yields:

- Waste: **4.43 pounds per person per day**; or 0.80626 tons per person per year.
- Recycling: **1.51 pounds per person per day**; or 0.27482 tons per person per year.

Multiplying the EPA's annual per capita waste generation rate (in tons) and population from the 2010 US Census (23,730), the estimated total waste generated (including recyclables) annually by the Township is 18,668.6 tons. Reported recycling is 3,641 tons of organics and 916 tons of curbside recyclables, totaling 4,557 tons. Reported tons of recycling in the Township is less than EPA's national estimates.

Conclusion: Air, water, and trucks are not confined to municipal boundaries so many environmental benefits realized from improved solid waste management extend beyond the Township boundary. Diesel Trash trucks consume large quantities of fuel. The imperfect burning of diesel fuel releases hydrocarbons into both air and water and are known to be toxic and cancer causing. Cars, not trash trucks, are the largest contributor of emissions in the Township. While damage from cars to the Township roadway surfaces are negligible, garbage truck impacts to roadways is likely the leading cause in accelerated roadway damage due to the extreme forces these heavy trucks impart on roadways surfaces. Roadway maintenance is one of the largest annual budgetary expenses for the Township.

Implementing a single hauler trash collection program that replaces the existing multiple hauler program will not eliminate the human health and environmental impacts from trash collection in the Township. However, assuming all other factors are constant, a single hauler system will increase the total recovery of recyclables and result in cumulative reduction in the total fossil fuel and total natural resource consumption that result from waste management activities within Township. The reduction of these impacts are difficult to quantify, and would be proportionally small when considering all Township activities. However, since an efficient single hauler program would be utilized for years to come, the environmental benefits would be cumulative and significant over time.

Local governments are involved when activities affect the health, safety, and welfare of the community as whole. Implementing efficient waste management practices improves community and regional health, safety and welfare.

TERMS

PM = particulate matter. PM2.5 refers to particulate matter that is differentiated based on size, in this case 2.5 micrometers.

NOx = Nitrous oxides - NOx is a generic term for mono-nitrogen oxides NO and NO2 (nitric oxide and nitrogen dioxide). They are produced from the reaction of nitrogen and oxygen gases in the air during combustion, especially at high temperatures. In areas of high motor vehicle traffic, such as in large cities, the amount of nitrogen oxides emitted into the atmosphere as air pollution can be significant. NOx gases are formed everywhere where there is combustion – like in an engine. In atmospheric chemistry, the term means the total concentration of NO and NO2.

NOx react to form smog and acid rain. NOx are also central to the formation of tropospheric ozone.

VOC = volatile organic compounds.

MTCE = Metric Ton Carbon Equivalent; Standard unit for greenhouse gas emissions calculations. A metric ton is approximately 2,200 pounds. One metric ton of carbon dioxide (CO2) expressed as MTCO2E, is produced to the meet the average monthly energy demand of the typical American household.

GHG = Greenhouse Gases are gases in an atmosphere that absorb and emit radiation within the thermal infrared range. This process is the fundamental cause of the greenhouse effect. The primary greenhouse gases in the Earth's atmosphere are water vapor, carbon dioxide, methane, nitrous oxide, and ozone. Greenhouse gases greatly affect the temperature of the Earth (Wikipedia, 2012).

COSTARS (Cooperative Purchasing Program)

- Home
- Resource/Training Center
- User Registration
- COSTARS Membership
- Search Contracts

COSTARS Contract Search

Contract --All--
Category --All--
Vendor --All--
Manufacturer --All--
Dealer --All--
Service Area County --All Counties-- Location County --All Counties--
Vendor Contract # Vendor #
Keyword Compactors Number of records per page 10 Search Reset

Search Results **14 Records Found.**

Vendor Contract #	Contract Description	Vendor Name	Web URL	Contract Overview	Vendor Contract	Contract Terms	Change Notice	Contract Renewal	COSTARS Point of Contact
017-028	Waste, Recycling, & Materials Handling Containers	Advanced Design & Control Corp dba Advanced Equipment Sales Inc	www.aesales.net						Emanuel Williams Ph:717-703-2946
017-029	Waste, Recycling, & Materials Handling Containers	BE Equipment Inc	www.beequipment.com						Emanuel Williams Ph:717-703-2946
017-001	Waste, Recycling, & Materials Handling Containers	Busch Systems International, Inc.	www.buschsystems.com						Emanuel Williams Ph:717-703-2946
017-022	Waste, Recycling, & Materials Handling Containers	Eagle Equipment Corporation	www.eagleequipmentcorp.com						Emanuel Williams Ph:717-703-2946
017-026	Waste, Recycling & Materials Handling Containers	Eagle Truck Equipment, Inc.	www.eagletruckequipment.com						Emanuel Williams Ph:717-703-2946
017-009	Waste, Recycling, & Materials Handling Containers	Kettle Creek Corporation d/b/a Windsor Barrel Works	www.windsorbarrel.com						Emanuel Williams Ph:717-703-2946
017-012	Waste, Recycling & Materials Handling Containers	Merkin Equipment Services (Bittone Equipment Services LLC DBA)	www.merkinequipment.com						Emanuel Williams Ph:717-703-2946
017-013	Waste, Recycling, & Materials Handling Containers	Mid Atlantic Waste Systems (THC Enterprises, Inc. t/a)	www.mawaste.com						Emanuel Williams Ph:717-703-2946
017-020	Waste, Recycling, & Materials Handling Containers	Orbis Corp	www.norsemanenvironmental.com						Emanuel Williams Ph:717-703-2946
017-024	Waste, Recycling, & Materials	Peter Pepper Products, Inc.	www.peterpepper.com						Emanuel Williams Ph:717-703-2946

Steven Deasy

From: PPI General Mail Box
Sent: Wednesday, July 09, 2014 3:18 PM
To: Steven Deasy
Subject: Re: Compost Gate System
Attachments: ug-141 gate spec sheet.gif; smart reader sac4159 cut sheet.gif; standard system 9_0.gif

Thank you for your call earlier today.

I have attached some information about the items that we spoke about for your reference:

The SAC-4159 is a proximity card reader that can be used by authorized persons to gain access to the composting area. The Standard System 9-0 diagram shows how this card reader and the gate would typically be set up.

The pass card is used to open the gate allowing the vehicle to enter. From the inside, the gate will open automatically to allow a vehicle to exit.

The SAC-4149's software can be set up on any PC and will maintain a user database as well as a record of all activity. The software is included with the SAC-4159.

The cost of the equipment would be as follows:

1 SAC-4159 Proximity Card Reader Incl. housing and stand	$1,430.00		
1 UG-141 Universal Gate Incl. 12' arm, loop detectors	$2,915.00		
1000 Standard Proximity Cards	$	3.25 each	$3,250.00 total
TOTAL	$7,595.00		

Please do not hesitate to contact me if you have any questions or need more information.

Sincerely,
Holger Niebisch
Parking Products Inc.

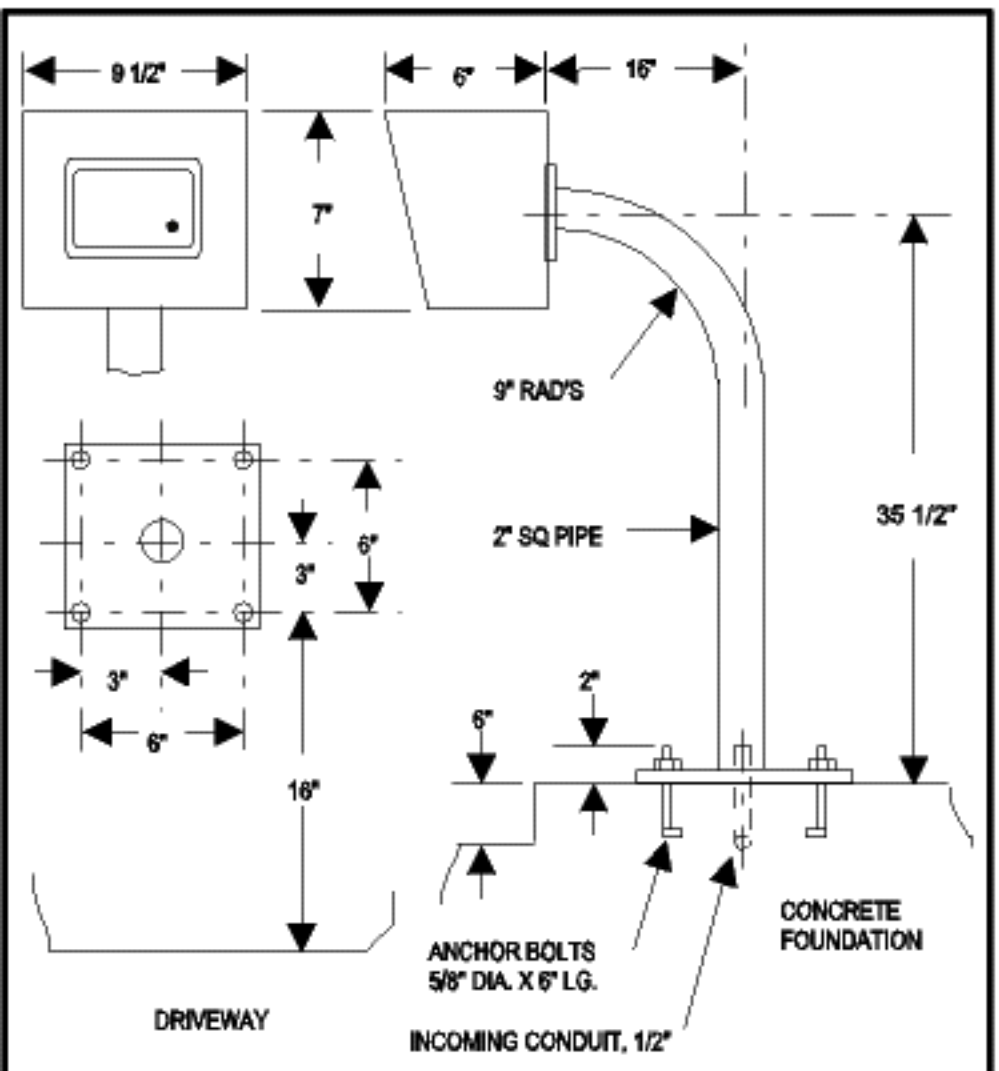
-------Original Message-------

From: Steven Deasy
Date: 7/9/2014 2:05:39 PM
To: ppi@parkingproducts.com
Subject: Compost Gate System

SMART READER SAC-4159

STANDARD GOOSE NECK PEDESTAL MOUNTED READER

TYPICAL WALL MOUNTED LONG RANGE READER



The SAC-4159 Smart Reader is a programmable card reader capable of operating in an on-line or off-line mode. The standard Smart Reader comes as a proximity card reader with a range of 6". Each reader can control 2 doors or lanes with the addition of a second proximity reader. Proximity readers with a range of up to 8 feet are available. Programming is done through a PC. All software is supplied with the reader as well as a cable to connect the reader and the PC. Any PC with Microsoft Windows can be used to program the Smart Reader. Once the reader is programmed, it will function on its own without further intervention. However, any changes to the programming such as card holder status must be downloaded to the reader in order to take affect. All programming is stored in nonvolatile memory. It is also possible to operate the reader in an on-line mode. In this mode, the reader must be connected to a PC either through an RS-485 network or wireless network. In an online mode, the activity of the reader can be monitored in real time. Activity reports and a user database can be created using the included software and any programming changes can be instantly transmitted to any reader. The Smart Reader has a relay output to open doors, gates, etc. The reader electronics can be located remotely to increase security and eliminate tampering.

AVAILABLE FEATURES:

Pedestal or wall monted

on or off line operation

Dry contact output to open gates, doors, etc.

12-24VDC 500mA operation

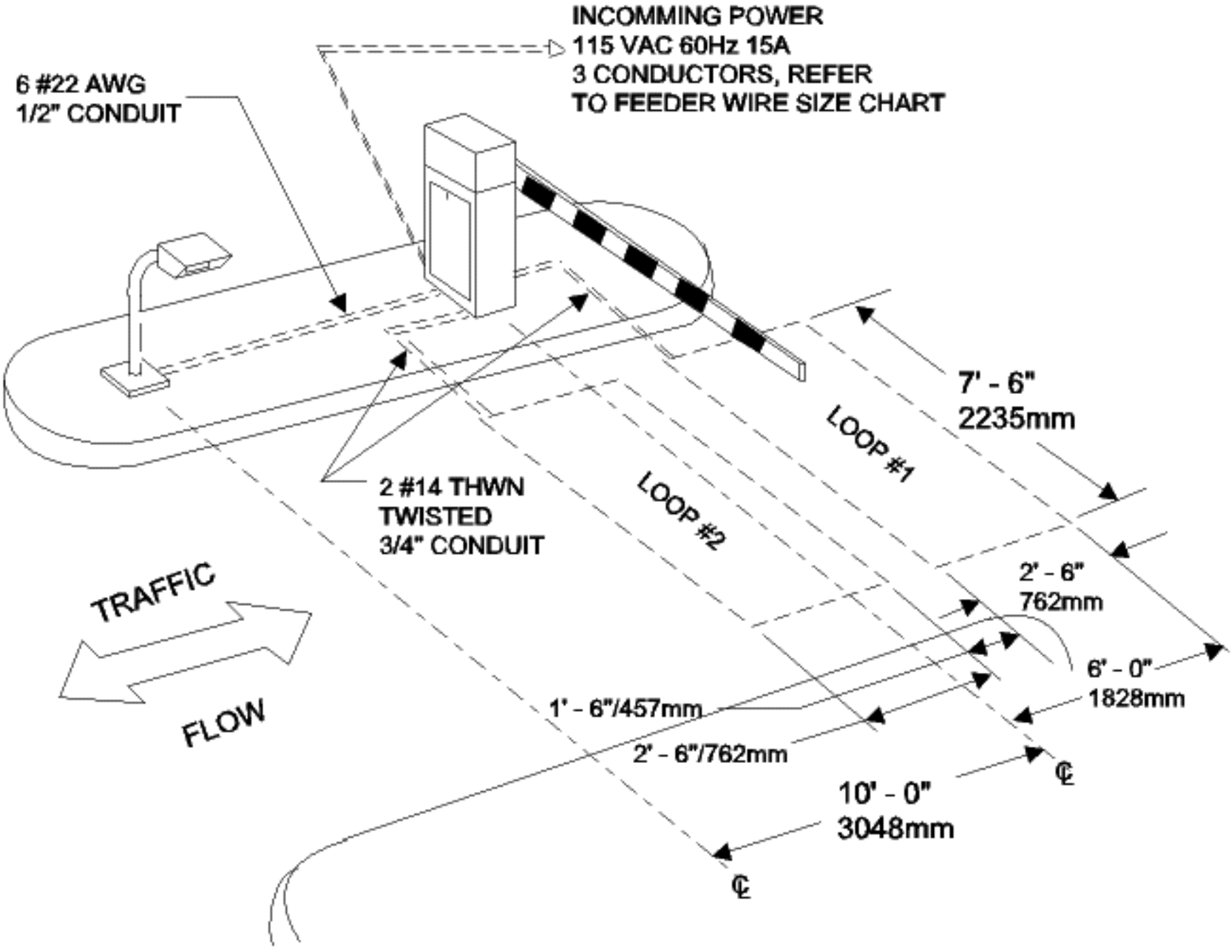
Proximity card technology with read ranges from 6" to 8 feet

Card size: 3 3/8" X 2 1/8" (85mm x 54mm) standard credit card size

PARKING PRODUCTS INC.
2517 WYANDOTTE ROAD
WILLOW GROVE PA 19090

PHONE 215-657-7500
FAX 215-657-4321
WWW.PARKINGPRODUCTS.COM

ppi PARKING PRODUCTS INC



NOTE: 1. Loops are centered in lane.
2. For additional information, refer to PPI manuals and drawing number SK-123-001.

SYSTEM FUNCTION

The patron inserts or scans the card at the card reader. If the card is accepted, the gate arm will rise and the vehicle can proceed. When a vehicle approaches from the free side, Loop #1 is activated which raises the gate arm permitting the vehicle to pass through the lane. As a vehicle, traveling in either direction, leaves Loop #2, the gate arm will automatically return to the down position.

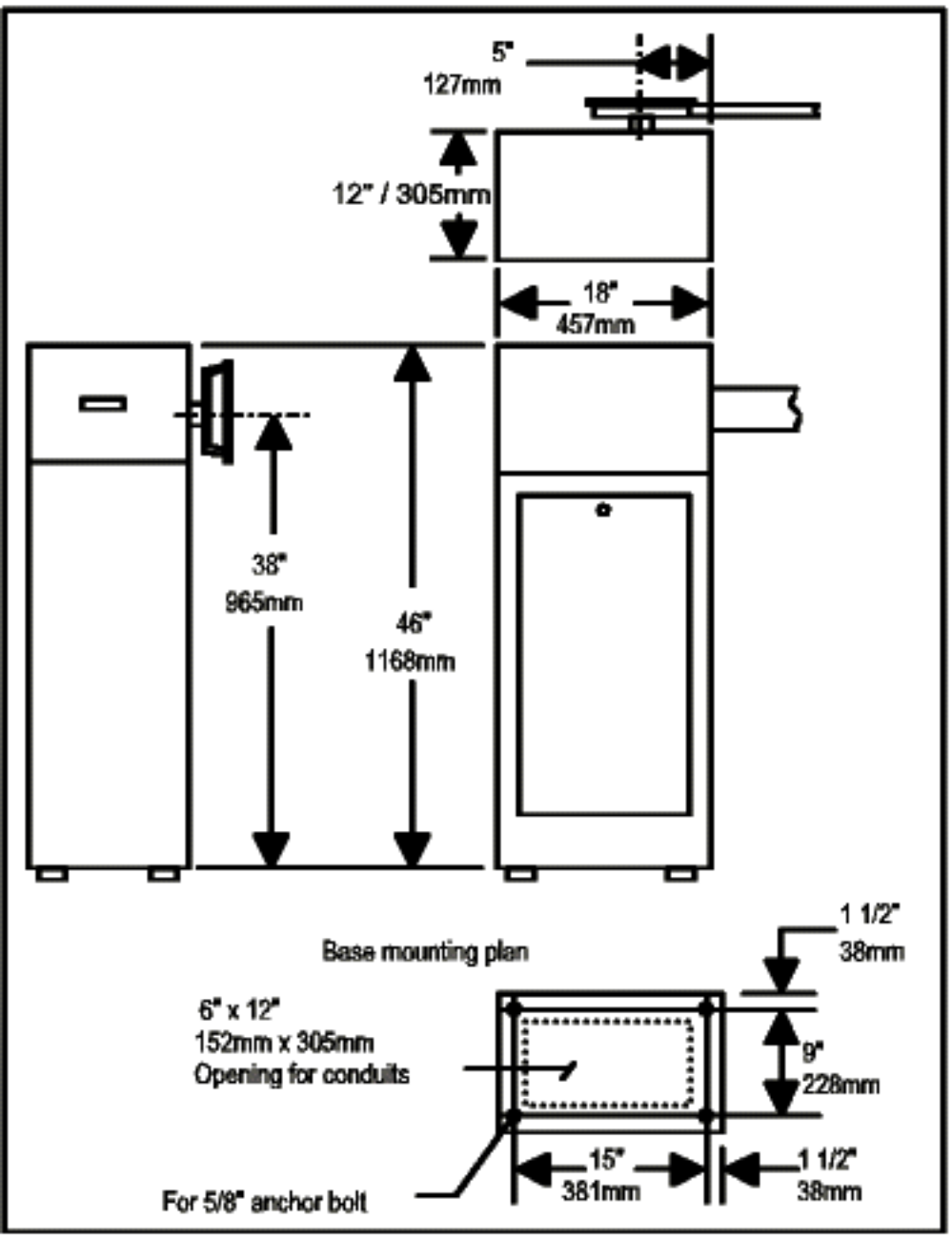
CARD READER, FREE ONE WAY

STANDARD SYSTEM 9-0

SHEET 1 OF 1

PARKING PRODUCTS INC.

UNIVERSAL GATE UG-141



The Model UG-141 Universal Gate is a barrier gate for standard parking applications. The gate arm is directly connected to the gear-motor by a steel shaft. This eliminates the need for belts and chains. Harmonic crank motion eliminates the need for mechanical brakes. All gate control circuitry is contained in a sealed, plug-in controller that can be replaced in seconds. Every gate controller is identical and is completely inter-changeable reducing maintenance requirements and the need to stock parts. The Universal Gate will work in conjunction with any loop detectors, ticket machines, card readers, etc. to offer the greatest degree of security and flexibility with the lowest maintenance costs.

AVAILABLE FEATURES:

#14 GA steel housing

1/3 HP motor

direct drive - no belts or chains to replace

120VAC or 240VAC operation

sealed plug-in controller

gate arms up to 12 feet

articulating arm for low ceilings

heater & thermostat for cold climates

safety edge (rebound) feature

PARKING PRODUCTS INC.
2517 WYANDOTTE ROAD
WILLOW GROVE PA 19090

PHONE 215-657-7500
FAX 215-657-4321
WWW.PARKINGPRODUCTS.COM