RECYCLING TECHNICAL ASSISTANCE
Project #564

FINAL REPORT

CITY OF READING
BERKS COUNTY, PENNSYLVANIA

PAPER PROCESSING EVALUATION

January 2015

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 study was conducted for the City of Reading (City) under the Recycling Technical Assistance program that is sponsored by the Pennsylvania Department of Environmental Protection (PADEP) through the Pennsylvania State Association of Township Supervisors (PSATS). The City is in the process of modifying a 2-acre City property referred to as the "Woodshed" in order to receive and bale mixed paper collected by the City Public Works Department. The Woodshed is used to store various supplies, equipment, and materials. The City requested a solid waste expert to assist in developing recommendations regarding implementation, operation, and layout of the proposed City paper baling program.

2.0 SUMMARY OF WORK

2.1 Background Information

The City of Reading operates a curbside solid waste and dual-stream recyclables collection program that includes the collection of commingled recyclables (i.e. plastics, steel/bi-metallic and aluminum bottles, cans, and containers) and separated mixed paper from approximately 27,000 units. Mixed paper includes newspaper, magazines, junk mail, cardboard, office paper, and cereal boxes. Commingled materials and paper are collected in split-compartment packer trucks. Commercial establishments secure solid waste collection services, and sometimes recycling services, with private waste haulers. The City is interested in increasing the recovery of recyclables from commercial establishments.

The City owns a 2-acre site near the intersection of Angora Road and Hill Road called the "Woodshed". The Woodshed has historically been utilized for miscellaneous storage related to Parks and Recreation activities. The Woodshed includes a building with separate storage bays that are currently used to store sand for baseball fields and other miscellaneous items. This building is reaching the final stages of modifications for its new use as a receiving and baling area for paper. By baling paper, the City hopes to increase its revenues for recovered paper while decreasing costs associated with transporting loose paper to more distant paper markets.

2.1.1 Incoming Material Volumes

Based on monthly reported recycling data from January through October 2014, the City collects an average of 245 tons per month of residential commingled recyclables or about 2,940 tons per year. Additionally, the City collects an average of 96 tons per month or about 1,150 tons per year of mixed paper. These monthly paper totals include paper collected from the Reading School District, which is estimated to represent 3 to 4 tons per month. Assuming 260 collection days per year, the City curbside recycling program recovers approximately 4.4 tons of paper per operating day.

2.1.2 Baler and Load Ramp Specifications

The horizontal baler (70861GA Piranha, Mid-Atlantic Systems) and yard ramp (Model 16YSD8036L, Koke Inc.) purchased by the City are essential pieces of equipment for paper processing and loading finished bales (refer to **Appendix A**, **Equipment Specifications**). Ninety percent of eligible equipment costs were paid by the PADEP through the Act 101, Section 902 Recycling Grant program. Based on discussions with the Mid-Atlantic Waste Systems sales representative, the 70861GA Piranha is a universal horizontal baler with a throughput of 2 to 3 bales per hour. The throughput is primarily limited by the time required to eject and then manually tie the bales with wire. The average weight of 60" mixed-paper bales is 1,500 pounds. The baler can process 3,000 to 4,500 pounds per hour.

Per discussions with the sales representative from Lift, Inc., the yard ramp by Koke, Inc. has a 16,000 pound carrying capacity and an adjustable height range of 42" to 60". The yard ramp includes a 16" lip that is 76" wide and fits inside standard box trailers to bridge the gap between the yard ramp and truck (**Appendix A**).

2.2 Site Visit

Gannett Fleming visited the Woodshed on November 19th, 2014. Key observations and findings for this visit are in included under findings, Section 2.3. Photographs from the site visit are included in **Appendix B**.

2.3 Summary of Findings

The Woodshed is located within 10 minutes of the center of the City of Reading and is generally a suitable facility for receiving and processing (i.e. baling) controlled deliveries of truckloads of paper. The paper processing capacity of the Woodshed and horizontal baler will be affected by delivery schedules, storage capacity for loose and baled materials, quantity of residual material in paper loads, staff utilization, site activities, weather and site conditions (e.g. roadways), and other factors.

Assuming active baling would be performed 5 hours per operating day, the baler can produce 10 to 15 paper bales weighing a total of 7.5 tons to 11.25 tons. To handle the current average quantity of 1,150 tons of mixed paper collected annually, the baler will need to operate 100 to 150 days per year. Once up and running and with proper staffing and operation, the Woodshed could feasibly convert the majority of paper collected through the City's curbside program into high-value paper bales. Baled mixed paper yields $50 to $125 per ton depending on markets and other cost factors including transportation. On average, the City currently receives $15 per ton for loose mixed paper delivered to JP Mascaro & Sons, Inc. located at 600 W. Neversink Road in Reading.

Woodshed Configuration (Paper Receiving, Baling, and Storage)

- The Woodshed site is approximately 2-acres and includes a gated entrance, loop flow traffic pattern, miscellaneous supplies and equipment, yard ramp, and a concrete block building with 6 covered storage bins (or bays).
- The footprint of the baler room (or Bin #6 of the building) is approximately 39.0' x 28.0'. The small size of the baler room and space limitations demand additional consideration is given to work flow, space utilization, materials management, equipment operation, and safety.
- At the time of the site visit in November 2014, a staging area for loading bales of paper into box trucks was not identified or prepared for use. There was also no loading ramp for handling finished bales. The existing load ramp near the center of the site is not suitable for loading baled paper with a bobcat or forklift. The mobile yard ramp procured by the City (**Appendix A, Equipment Specifications**) is suitable for loading paper bales.
- Based on a preliminary review of the proposed baler configuration, the horizontal baler will be oriented inside the baler room so that bales will eject at the north end of the building and the conveyor feed would be positioned to the south. This baler configuration appears to be the only feasible configuration based on the anticipated operation, work flow, and space limitations of the room. In this baler configuration, a bobcat or other equipment will operate near the electrical boxes when removing finished bales (Photo 1). There is potential risk of the electrical equipment being damaged and possible injury could result.

- The only concrete surface that can be used to dump truckloads of loose paper is located immediately outside the baler room. Dumping loose paper in front of the two overhead doors that serve as the ingress and egress to the baling area may periodically restrict operational flow.
- There are four (4) covered bays with concrete walls attached to the processing building. The bay immediately adjacent to the processing building has a narrow doorway and non-rectangular shape and is not suitable for loose or baled paper storage.
- The building is constructed of masonry block walls that are susceptible to damage by impacts from bobcats or other equipment during routine handling of loose and baled paper. No protective push walls are in place inside or outside the processing building to protect concrete block and facilitate paper handling.
- At the time of the site visit in November 2014, no trash or recycling containers were located in or near the paper processing building.

3.0 SOLUTIONS

Based on findings and observations, the following solutions are proposed to enhance the performance of the Woodshed paper processing operation:

- Convert Storage Bin #5 into a room to store miscellaneous supplies to support the baling operation (e.g. bale wire, tools, safety equipment, greases, brooms, cleaning supplies, etc.)
- Convert Storage Bin #4 into a storage area for deliveries of loose paper. Install a concrete floor to replace the dirt floor to prevent scraping up dirt and rocks that may damage the baler and degrade material quality. Extend the concrete approximately 15' (or equivalent width of the concrete in front of the baler room) outside existing Storage Bin #4 to allow trucks to dump loose paper on a concrete pad so paper can be pushed into the storage bay.
- Reserve Storage Bin #3 for loose paper overflow. It is not necessary to concrete the floor of Storage Bin #3 at this time.
- Storage Bin #2 should be cleaned out and reserved for finished bale storage if needed. Storage bins used for finished bales do not require a concrete floor.
- No changes are recommended for Storage Bin #1 at this time.
- Generally, in any area where loose paper or baled paper may be pushed against existing concrete block walls, a push wall is recommended to protect the concrete block from damage. Push walls can include a concrete jersey barrier, interlock concrete block, or a steel plate fastened to the concrete block (saves space). If push walls are not used, operators must use care to minimize impacts to the block walls.
- A push wall is recommended to be located immediately outside the baler room along the edge of the concrete pad outside the building and to the south. This push wall will allow the bobcat to consolidate and scoop up loose paper dumped on the concrete outside the baler room. For this application, one or two precast concrete jersey barriers with forklift holes are recommended so the barrier can be moved as needed. As an alternative to purchasing pre-cast barriers, the City could use wooden forms and concrete and build concrete barriers.
- After operations are underway and if dumping loose paper on the exterior pad interferes with work flow, the concrete pad in front of the baler room should be extended approximately 15' south so operators can consolidate paper near the baler without interfering with the entrance and work flow.
- Due to space limitations in the baler room, it is recommended the scale for weighing bales is not fixed to the floor so it can be moved as needed. On days when weather permits, the scale could be placed outside the baler room on the concrete pad between the overhead doors.

- An exterior electrical outlet is recommended to power the bale weighing scale when it is placed outside and for general use. A possible location of an exterior outlet is shown in Photo 2.

- Due to the risk of equipment damaging electrical panels and possibly injury, the City should closely evaluate the proposed baler configuration and implement measures (e.g. shielding) to protect electrical panel boxes.

- It is recommended the area to the south of the paper processing building be prepared for the yard ramp and to stage and load box trucks with finished paper bales. The area should be cleared, including minor earthwork and removal of the old mixer. Since equipment and box trucks will use this area frequently, the subgrade should be compacted and gravel should be placed and maintained.

- If the City begins to send regular paper deliveries in split load packer trucks to the Woodshed, it should implement a roadway maintenance plan for the site. Due to the heavy axel load from packer trucks, paper deliveries will accelerate rutting and road damage to the unpaved road surfaces at the Woodshed, particularly in wet conditions.

- If needed, the existing yard ramp in the center of the site could be utilized to load roll-off containers or open top trailers with loose paper. This is useful in the event the baler is shut down for maintenance or during any occasion where incoming paper deliveries exceed storage or processing capacity.

- It is recommend two (2), 2-cubic yard self-tipping hoppers are placed near the baling operation (Photo 3). One hopper should be dedicated for trash (i.e. residuals) that will be removed from paper prior to baling. The other hopper should be dedicated for commingled recyclables that will be generated during normal operations and removed from incoming loads. The self-tipping hoppers can be moved easily by a forklift as needed to any location and elevated and dumped into nearby roll-off containers. Self-tipping hoppers range in price from $750 to $1,500 new.

- It is recommended the City begin negotiations with multiple paper markets and consider entering short-term marketing agreements (e.g. one year, with a one-year

renewal option) for paper. For these agreements, the City should request per-ton pricing for baled and loose paper. Since it may be feasible that a market would spot a box trailer at the Woodshed site and provide transportation, the City should request per-ton pricing including transportation and for deliveries to the door of the market. To minimize risk to the City, and to the market relating to market price fluctuations, the City should use a paper pricing structure or formula that is tied to a regional paper market index. The City should also set a floor price of no less than zero, so that it never has to pay to process paper. Possible area markets include the following.

- Cougle's Recycling, Inc. (CRI)
  Hamburg PA 19526

- Republic Services (Allied)
  King of Prussia, PA 19406

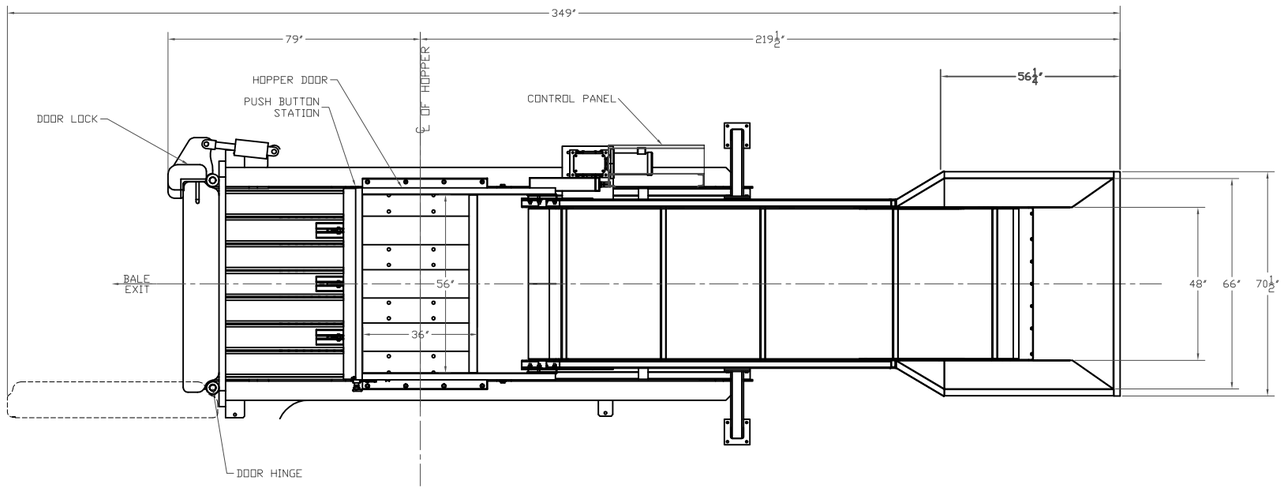
- JP Mascaro & Sons, Inc.
  Reading, PA 19606

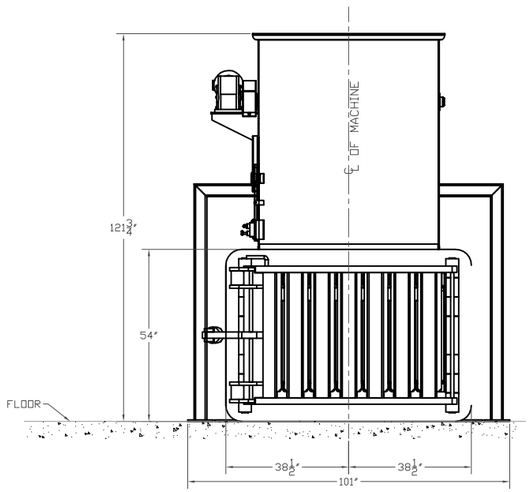
- United Corrstack
  Reading, PA 19602

APPENDIX

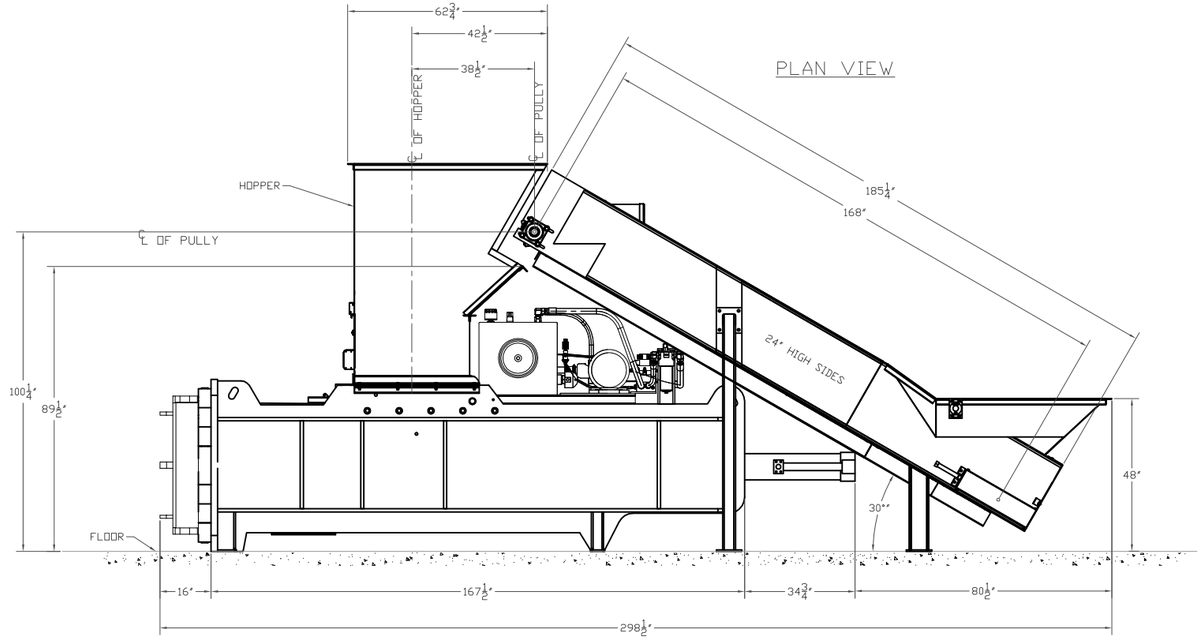
Appendix A – Equipment Specifications
Appendix B – Site Photos (Woodshed)
Appendix C – Conceptual Layouts (1 and 2)

SUPPLY OPTIONS BY HARRIS
HARRIS BLUE
20HP
460V
HYDRAULIC OIL
SHIP WITH CONVEYOR #9446





END VIEW
CONTROL PANEL & PUSH BUTTON NOT SHOWN FOR CLARITY



ELEVATION VIEW
CONTROL PANEL NOT SHOWN FOR CLARITY

DRAWING APPROVAL

This Drawing Is Forwarded For Your Approval. Please Check The Appropriate Box And Return Immediately, Either Giving Approval or Noting Changes Requested.

APPROVED ☐
NOT APPROVED ☐

FIRM: _____
BY: _____
DATE: _____

QUOTED DELIVERY TIME WILL DEPEND UPON TIMELY RECEIPT OF APPROVAL DRAWING

THE PURPOSE OF THIS DRAWING IS TO INDICATE THE OVERALL DIMENSIONS AND CONFIRM THE CONFIGURATION OF THE BALER. IT IS NOT TO BE SCALED FROM AND USED FOR CONSTRUCTION PURPOSES. ANY CHANGES MADE TO THIS DRAWING BY THE CUSTOMER ARE NOT THE RESPOSIBILITY OF HARRIS WASTE MANAGEMENT GROUP

REV.	DESCRIPTION	BY	DATE

DRAWN BY: MOT	DATE: 11/07/14	Dimension's are subject to change without notice.	HARRIS WASTE MANAGEMENT GROUP
CK. BY:	DATE:	DO NOT SCALE	BAXLEY OPERATIONS

Date: _____ Released By: _____

JOB#: 70861	DESCRIPTION: Piranha GENERAL ARRANGEMENT	
CUSTOMER: CITY OF READING		
DEALER: MID-ATLANTIC	SCALE: NONE	DRAWING: 70861GA
	SHEET: 1 OF 1	

Yard Ramps (All Steel)

Our all-steel **yard ramp** is built for ground to dock and ground to trailer applications. Double acting pump brings yard ramp up to desired height quickly for fast, efficient moving of product. Serrated steel grating provides for traction, as well as offers escape for snow, ice and debris build-up. Standard ramp positioner attaches to **forklift fork** and makes moving the dock ramp a breeze!

This portable **yard loading ramp** is easy to move, goes anywhere and lets you move freight quickly. Large 16" solid pneumatic tires work well on hard packed surfaces. Optional tandem wheels are ideal for loose soil conditions.

For ground to trailer usage, the 6-foot level off **yard ramp** is recommended for safe, **level unloading**. Our 16" lip extends into trailer, and yard ramp is secured to trailer with safety chains.

Standard capacities are 16,000, 20,000 and 30,000lbs. 68" and 80" widths are standard. **Custom sizes and capacities are available upon request.**

As an authorized yard ramp distributor, we will help you select the proper **dock ramp** for you application.

Features:

- All steel yardramp with manual hydraulic pump.
- Working range form 38" to 62"
- 16" lip
- Safety chain
- Model numbers ending in "L" include 6' level off (recommended for use with trailers).

RAMP POSITIONER
STANDARD

SOLID RUBBER WHEELS
STANDARD

TANDEM WHEELS
OPTIONAL

Freight Class: Special Shipping - Contact Factory

MODEL	CAPACITY	OVERALL WIDTH	USEABLE WIDTH	LENGTH	WEIGHT (LBS)
16YSD6830	16,000 LBS	68"	63"	30'	4,175
16YSD6836L	16,000 LBS	68"	63"	36'	5,120
16YSD8030	16,000 LBS	80"	75"	30'	4,985
16YSD8036L	16,000 LBS	80"	75"	36'	5,850
20YSD6830	20,000 LBS	68"	63"	30'	4,385
20YSD6836L	20,000 LBS	68"	63"	36'	5,335
20YSD8030	20,000 LBS	80"	75"	30'	5,200
20YSD8036L	20,000 LBS	80"	75"	36'	6,065
25YSD6830	25,000 LBS	68"	63"	30'	4,785
25YSD6836L	25,000 LBS	68"	63"	36'	5,770
25YSD8030	25,000 LBS	80"	75"	30'	5,615
25YSD8036L	25,000 LBS	80"	75"	36'	6,565
30YSD6830	30,000 LBS	68"	63"	30'	5,100
30YSD6836L	30,000 LBS	68"	63"	36'	6,100
30YSD8030	30,000 LBS	80"	75"	30'	6,050
30YSD8036L	30,000 LBS	80"	75"	36'	6,900

OPTIONS

YSD-OPT 01	TOW BAR
YSD-OPT 03	TANDEM WHEELS
YSD-OPT 04	NO UNDERCARRIAGE DEDUCT

City of Reading – Woodshed – Paper Baling Site
Photos 11-19-14

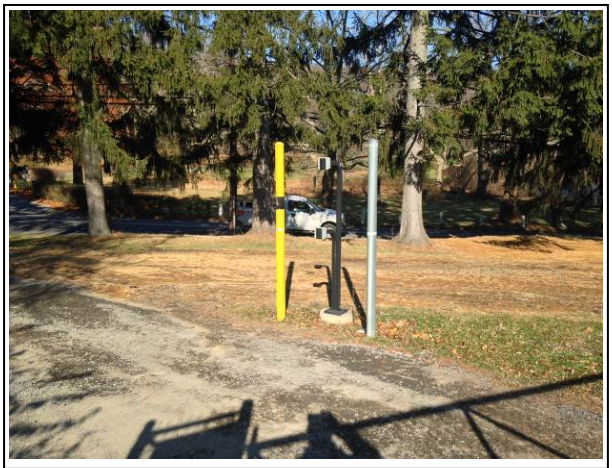


Photo 1: 11-19-14. Woodshed Paper Baling Site Entrance gate. Electronic key access.

Photo 2: 11-19-14. Woodshed Paper Baling Site Entrance gate and interior road.

Photo 3: 11-19-14. Woodshed Paper Baling Site Yard load ramp constructed of interlocking block.

Photo 4: 11-19-14. Woodshed Paper Baling Site Storage bins.

Photo 5: 11-19-14. Woodshed Paper Baling Site Mixer (foreground) and paper processing building. Proposed area for staging box truck for paper bales.

Photo 6: 11-19-14. Woodshed Paper Baling Site South end of paper processing building.

City of Reading – Woodshed – Paper Baling Site
Photos 11-19-14

Photo 1: 11-19-14. Woodshed Paper Baling Site Baler Room (Storage Bin #6)

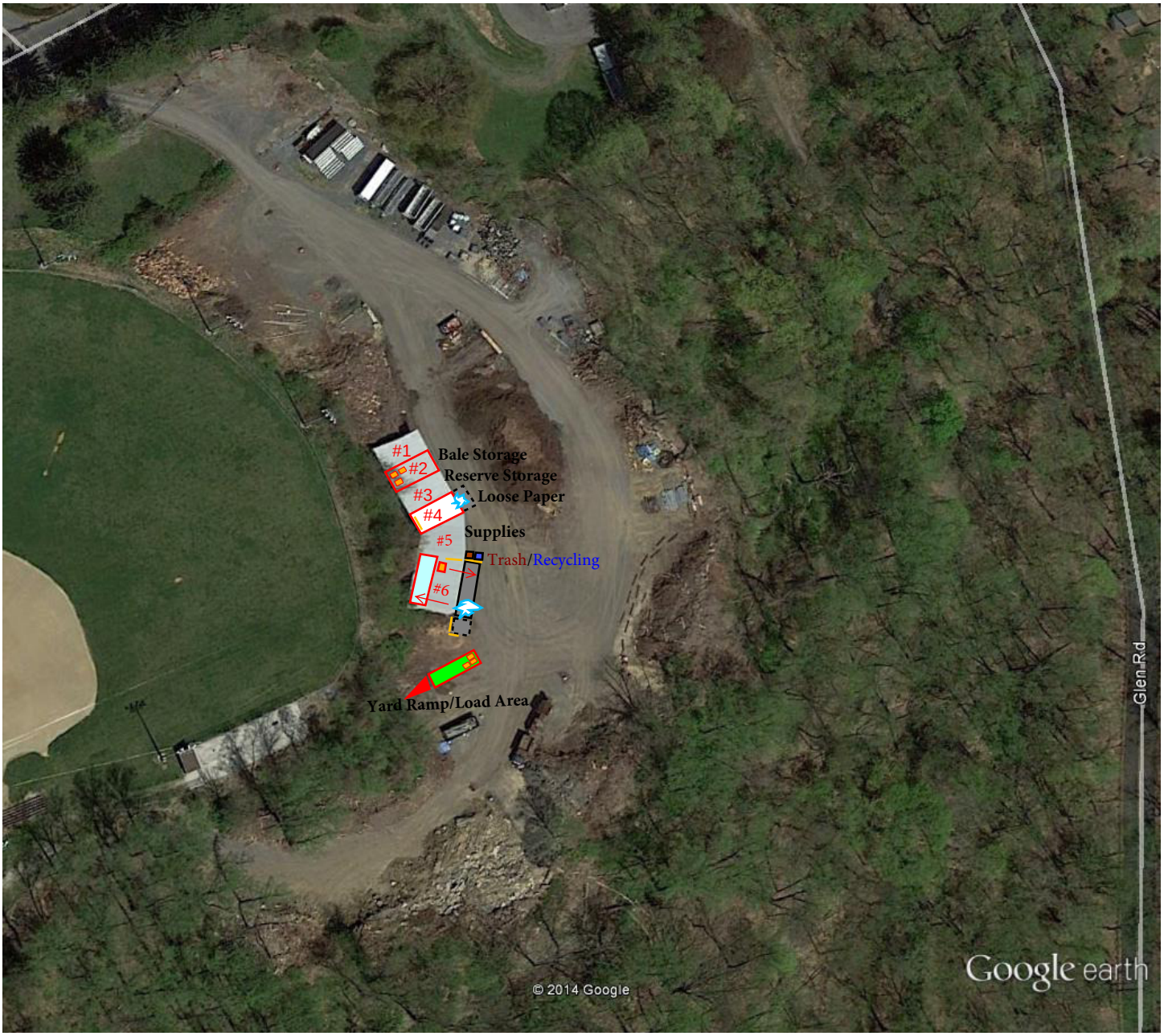
Photo 2: 11-19-14. Woodshed Paper Baling Site Baler Room (Bin #6). Electric on north interior wall.

Photo 3: 11-19-14. Woodshed Paper Baling Site Storage Bin #5. Nonrectangular bay with narrow entrance.

Photo 4: 11-19-14. Woodshed Paper Baling Site Storage Bin #4. Sand.

Photo 5: 11-19-14. Woodshed Paper Baling Site Storage Bin #3.

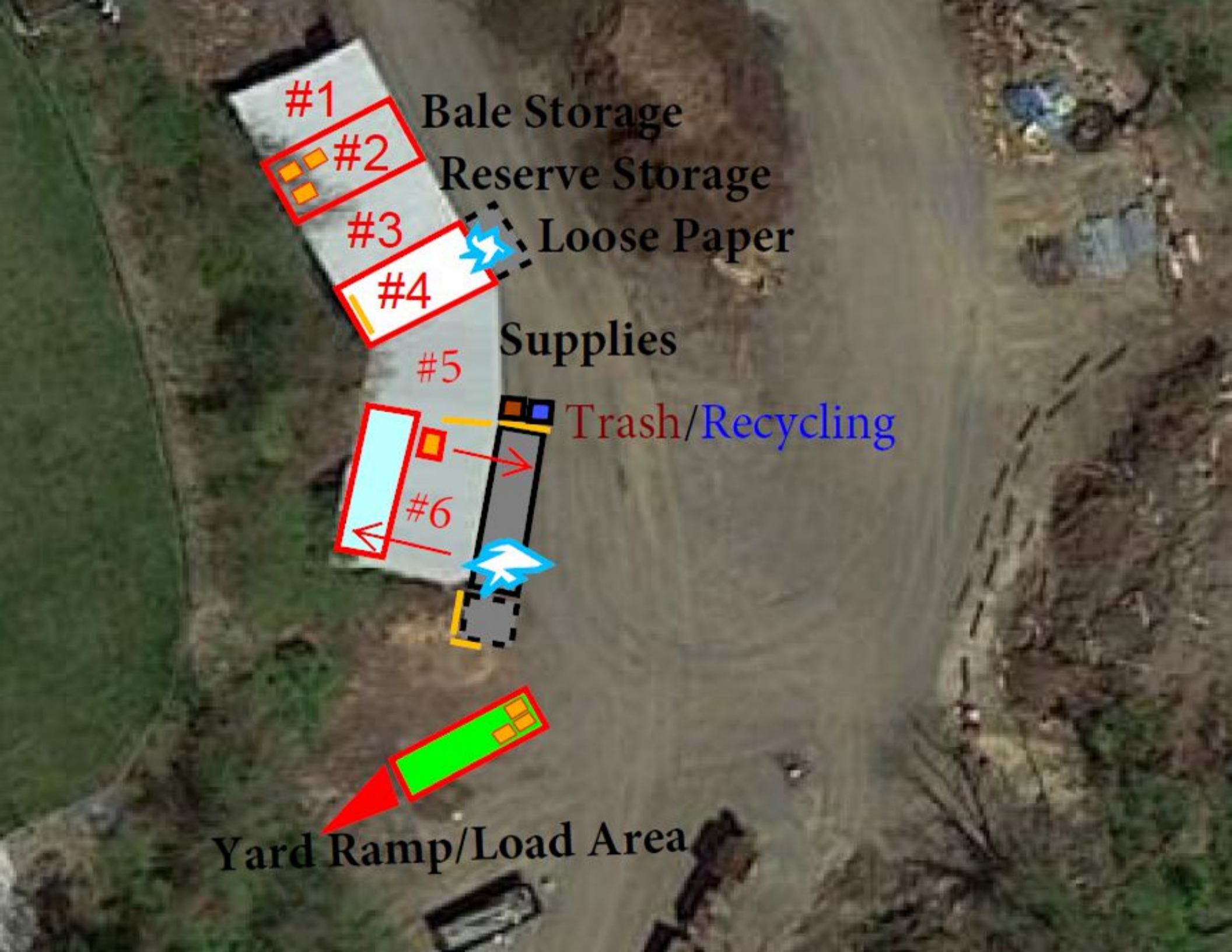
Photo 6: 11-19-14. Woodshed Paper Baling Site Storage Bin #2. Miscellaneous items.



Google earth

feet 400
meters 100

- Push wall
- Paper bale
- Box truck
- Paper tipping area
- Loose paper storage
- Paper bale storage
- 2 cubic yard self-tipping hopper (commingle recyclables)
- 2 cubic yard self-tipping hopper (trash)
- Proposed Concrete Pad
- Horizontal Baler


#1
#2
Bale Storage
Reserve Storage
#3
#4
Loose Paper
Supplies
#5
Trash/Recycling
#6
Yard Ramp/Load Area