

Recycling Technical Assistance Project # 570

Chester County

C&D Evaluation

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

July 2015



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RECYCLING TECHNICAL ASSISTANCE PROJECT # 570

CHESTER COUNTY

C&D EVALUATION

1. STATEMENT OF THE PROBLEM

Chester County currently has limited opportunities for construction and demolition (C&D) waste recycling in the County. This study summarizes the current C&D processing outlets in the county, develops a concept for a new centralized C&D processing facility, estimates processing (per ton) costs for a new C&D processing facility, and tabulates benefits to developing a new C&D processing facility in the County. The study recommends detailed evaluation beyond the scope of this technical assistance project, as appropriate.

2. BACKGROUND DATA ON TONNAGES AND FEES

The current construction and demolition waste disposal needs of Chester County, Pennsylvania located in Southeastern Pennsylvania, are primarily serviced by two public landfills. The Lanchester Landfill, located in Honey Brook Township (Chester County), Salisbury Township (Lancaster County) and Caernarvon Township (Lancaster County), services the needs of 49 Chester County municipalities, and is owned and operated by the Chester County Solid Waste Authority (CCSWA). The SECCRA Landfill, located in London Grove Township (Chester Co.), services the needs of the remaining 24 Chester County municipalities, and is owned and operated by the Southeastern Chester County Refuse Authority (SECCRA). The landfills offer a small amount of segregated C&D waste dropoff opportunities. The Lanchester Landfill currently (2015) charges \$61 per ton for C&D waste disposal. The SECCRA Landfill currently (2015) charges \$68 per ton for waste disposal, including C&D waste. For C&D recycling to offer economic benefits to the county and its residents, **the target fee for processing this material** in a new C&D processing facility should not exceed the low to mid-\$60's per ton, which is equivalent to the current cost for disposal of this material in the two public landfills in Chester County.

Five years ago, the Pennsylvania Department of Environmental Protection (PADEP's) Waste Origin and Destination Reports indicated that approximately 87,000 tons per year of C&D waste was generated from within Chester County, of which about 60% (52,000 tons) was disposed at either the Lanchester Landfill or the SECCRA Landfill. The remainder of C&D material generated from Chester County in 2010 (approximately 35,000 tons) was transported to out-of-county landfills, primarily Sandy Run Landfill and Cumberland County Landfill. For the next 3 years, PADEP records indicate that C&D waste disposal in Chester County dropped to 46,600 tons (2013) and increased about 20% to 56,000 tons (2014). Contrasting this is the fact that the tonnage of C&D waste delivered to the two public landfills in the County have stayed relatively constant, varying between approx. 43,000 and 54,000 tons per year. Perhaps some of the larger variations in C&D waste that was transported to other disposal sites were due to one-time demolition projects for large contractors that used the other sites. PADEP Waste Origin and Destination Reports for Chester County for 2010-2014 are included in Appendix A.

It is noted that C&D waste that goes out of state (e.g. Delaware, Maryland) is not required to be reported to PADEP. Also, C&D waste that goes to C&D-only landfills (such as the Milton Grove Landfill in Lancaster County) does not need to be reported to PADEP. Therefore, the PADEP waste and destination reports may not reflect all of the C&D waste that is generated in Chester County.

For the purposes of this study, based on review of DEP records, a hypothetical C&D processing facility has been sized to handle approximately 60,000 tons of material. It is acknowledged that this average annual tonnage figure may not fully include all C&D waste (i.e. unreported tonnages) currently generated in Chester County. However, by sizing the facility at 60,000 tons per year of processing capacity, for analysis purposes, the operation can be optimized in the early years and earn revenues without significantly overbuilding or overcapitalizing for future needs. Further analysis of wastestream generation may result in an adjustment to this processing capacity assumption, for later consideration.

The types of C&D waste to be processed in the County were to be identified from a Season 1 waste characterization sort to be completed independent of this technical assistance project. The results of the initial sort were to be used to help confirm the type(s) and appropriateness of the selected C&D processing concept selected for analysis. The commencement of this waste characterization sort were delayed by Chester County. Therefore, general assumptions about the types of C&D waste that need to be processed in the County were made. These assumptions are included in the operating cost spreadsheet in Appendix F.

3. SUMMARY OF WORK COMPLETED

3.1 CONSTRUCTION & DEMOLITION MATERIALS PROCESSING AND/OR DISPOSAL SITES IDENTIFICATION, HAULING COST ESTIMATES

Initial work completed to perform this assignment included the gathering and review of background data on tonnages and rates, which was used to establish needs of the County and economic factors for analysis. This information has been summarized in Section 2 of this report.

MSW Consultants consulted with Ms. Nancy Fromnick, Recycling Coordinator with the Chester County Solid Waste Authority (CCSWA), to determine the current C&D materials processing outlets for Chester County municipalities. A listing of facilities that accept C&D materials for processing and/or disposal, and the types of materials they accept are presented in a table in Appendix B of this report.

Selected C&D materials processing and/or outlets in the region and their addresses have been identified for the purpose of computing approximate travel distances from Downingtown, which was identified as a central location in Chester County (i.e. the approximate centroid of the County). The theory of a centroid is that while some County municipalities may be closer or farther away from each selected processing facility, the average hauling distance of all Chester County municipalities to each of the sites will approximate this average distance from the centroid to the site. A hauling cost per mile to round-trip hauling distances was applied based on past experience with applying planning-level hauling costs in other studies. For this study an average hauling cost of \$2 per haul mile was used, including equipment, labor and fuel, and assuming an average travel speed of 35-40 mph. This includes stops, but not the time required to load or unload the dump trucks (which is assumed equivalent for

all processing/disposal options considered). Assuming an average direct-haul dump truck payload of 10-15 tons (for relatively heavy C&D), this hauling cost per mile equates to between 13 and 20 cents. This rate was applied to the round-trip miles from the centroid point to each selected C&D processing and/or disposal facility.

Appendix C presents the results of this C&D materials hauling cost analysis. As the table illustrates, the direct-hauling cost for C&D materials to existing C&D processing/disposal sites is estimated to vary from approximately \$4 to \$20 per ton, based on truck payload and processing/disposal site used. Hauling those C&D materials to a centrally located C&D processing site near Downingtown could result in a cost savings compared to hauling the C&D materials to out-of-county sites.

3.2 CONCEPTUAL C&D PROCESSING LINE LAYOUT, OPERATING COST ESTIMATE

Task 3 involved consideration of available C&D processing equipment/system vendors, and selection of a proposed system concept for estimated costs. This technical assistance project does not include the sizing or pricing of individual equipment components by MSW; rather, an overall estimate was requested from the preferred system vendor. The task does not include site selection, detailed site layout, or CAD-prepared layout drawings.

MSW Consultants considered multiple vendors, and chose LuboUSA (Lubo) as the selected C&D materials processing equipment/system vendor for the purpose of developing a proposed centrally-located processing system concept and estimated operating cost per ton economics. MSW Consultants has worked with Lubo elsewhere in the MidAtlantic, and Lubo is part of the Van Dyk Recycling Systems (VDRS) family of equipment and system providers that also includes Bollegraaf and other manufacturers. MSW Consultants met with Nancy Fromnick and Bob Watts of CCSWA, and a consensus was reached to follow MSW Consultants' recommendation to base the Chester County C&D feasibility analysis on the Lubo technology and budgetary costs.

General information on Lubo's C&D processing equipment and systems are presented in Appendix D.

A targeted maximum tipping fee of \$60 per ton was used for this analysis. This tipping fee is generally equivalent to the current cost of landfill disposal of this material. A total of 60,000 tons per year of C&D materials throughput was assumed for sizing and operations. This approximates the amount of C&D materials that the two public landfills in the County receive annually. Peter Bond, the regional representative of Lubo, provided MSW Consultants with conceptual process line layouts and budgetary operating cost estimates for a C&D processing line in a building that can handle 60,000 tons per year of construction and demolition waste materials. Illustrations of the layout of the conceptual C&D processing equipment line are presented in Appendix E.

Lubo has prepared an operating cost spreadsheet to illustrate whether a \$60 per ton tip fee for C&D processing, with 60,000 tons per year of throughput, is cost-competitive on a per-ton cost basis. This spreadsheet is presented in Appendix F. The following cost estimates are included in the spreadsheet: \$4.5 million equipment processing line, \$2 million buildings and site; annual amortization costs of \$546,000 for plant equipment and \$145,000 for site and buildings. An \$80,000 annual allowance has been added for building and site maintenance. Based on Lubo's assumptions on Chester County's C&D waste characteristics and revenue streams for various materials, an estimated \$60 per ton tip fee will yield an annual profit of nearly \$2 million. Further analysis will need to be performed

to confirm that these cost estimates are reasonable and all-inclusive, and that the assumed waste stream and markets compare favorably with actual market data. Also, further analysis should be completed to establish a break-even tip fee or a required fee with a modest profit factor included.

Some of the cost factors that need to be confirmed during follow up evaluation include building costs, site and infrastructure costs, support equipment and rolling stock costs, land costs, and soft costs to implement the project. Often, these types of C&D sorting systems are either placed outside or are placed inside an existing, repurposed or previously abandoned industrial building. Should building construction and land acquisition be required, the following estimates are provided for illustrative purposes only. Construction costs of \$100-\$200 per square foot are not unreasonable. A minimum building footprint of 10,000-20,000 square feet is required. (Note: the Lubo estimate used \$2 million for a building and site). Land acquisition costs could range from \$50,000 - \$100,000 per acre. A 5 – 10 acre site in the vicinity of Downingtown would potentially be required. The site would house the C&D equipment building, building access, bale and bunker storage (most of which could be outside the building), roads and related ancillaries and between \$250,000 and \$1 million based on the above noted assumption. (Note: land is not separately estimated in the Lubo spreadsheet). Basic site/infrastructure improvements will vary depending upon existing site utilities, grading, paving, etc., with anticipated costs of at least \$100,000 - \$200,000. (Note: this isn't separately estimated in the Lubo spreadsheet). Rolling stock (skid-steer loader, front loader, fork-lift, etc.) is additional cost and is not included in the Lubo figures. A baler system should not be needed for C&D materials shipping, since these segregated materials are commonly direct-hauled to markets without further compaction. Soft costs, including engineering, permitting, legal, and related items should be budgeted at 15-25% of the construction cost estimate (excluding land), and a minimum 10-20% design/construction project contingency should also be included in the cost estimate.

4. RECOMMENDATIONS

An increase in C&D materials diversion in Chester County through increased or “facilitated” recycling opportunities may lessen the delivery of materials to the two public landfills in Chester County (Lanchester and SECCRA), preserve remaining landfill space, and potentially generate revenue at a publicly-sponsored processing facility.

This initial analysis has determined that C&D recycling could be cost-effective compared to landfilling the materials. If CCSWA and SECCRA review this report and wish to pursue further, the estimated costs should be further refined based on specific building, site, and infrastructure requirements.

Once the visual waste characterization of the C&D wastestream as described in Section 2.0 is completed, the appropriateness of individual components of the Lubo layout can be further confirmed or modified and the operational costs updated. Materials markets and revenue options should also be further investigated and forecast for short and long-term outlooks.

The savings in C&D materials hauling costs to more distant C&D processing and/ or disposal sites may help justify the economics of a centrally located facility (a potential hauling cost savings estimated at between \$4 and \$20 per ton of C&D materials hauled, depending on processing/disposal site used).

Should a centralized in-county C&D processing facility be confirmed at that time, follow up steps for further development of this concept can be established. Further, should feasibility be confirmed and should there be interest in developing this project, the need to direct Chester County recyclables to

the centralized processing facility via the use of an expanded Designated Site Ordinance should be considered and further developed with the goal of directing C&D wastes to the central facility. Finally, the County Solid Waste Plan may require modifications to include more control of these wastes to a county facility.

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APPENDIX A

**CHESTER COUNTY PADEP WASTE ORIGIN
AND DESTINATION REPORTS 2010-2014**

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Commonwealth of Pennsylvania
Department of Environmental Protection
Bureau of Waste Management
Division of Reporting and Fee Collection

Note: This reports does not show waste shipped from Pennsylvania counties to out-of-state disposal facilities, nor does it show waste collected for recycling.

County Waste Destinations
in Tons (2000 lbs.) of Waste

For Year: 2010

County : CHESTER

Permit	Disposal Facility Receiving Waste	Waste Type:	Municipal	Residual	Sewage Sludge	Infectious	Construction	Ash Residu	Asbestos	Total
100113	MODERN LANDFILL		0	17227.7	0	0	0	0	0	17227.7
100345	DELAWARE COUNTY SWA ROLLING HILLS		7830.1	0	0	0	0	0	0	7830.1
100346	PIONEER CROSSING LANDFILL		1681.8	996	0	0	744.5	1759.2	0	5181.5
100944	CHESTER COUNTY SWA LANCHESTER LAN		223385.1	11446.6	2288.7	5992.5	26163.2	0	220.6	269496.7
100945	CUMBERLAND COUNTY LANDFILL		0	756.9	0	0	10774.7	0	0	11531.6
100955	CLINTON COUNTY SWA WAYNE TOWNSHIP		0	0.1	0	0	0	0	6	6.1
101069	S.E.C.C.R.A. LANDFILL		74707.4	2526.2	1277.2	0	25540.2	0	0	104051
101397	ADVANCED DISPOSAL SERVICES GREENT		0	45.6	0	0	0	0	0	45.6
101494	TULLYTOWN RESOURCE RECOVERY FACIL		18148.3	272.4	41.7	617.5	24.7	0	4.3	19108.9
101509	CONNESTOGA LANDFILL		288.7	3246	0	6.8	85.8	8473.9	42.3	12143.5
101538	SANDY RUN LANDFILL INC.		0	0	0	0	23620.6	0	0	23620.6
101615	COMMONWEALTH ENVIRONMENTAL SYST		0	0	0	0	0.9	0	0	0.9
101680	G.R.O.W.S. NORTH		0	193.8	0	0	5.2	0	9.2	208.2
400558	COVANTA PLYMOUTH RENEWABLE ENERG		588.9	0	0	0	0	0	0	588.9
400592	LCSWMA RESOURCE RECOVERY FACILITY		0	384.6	0	0	0	0	0	384.6
400593	COVANTA DELAWARE VALLEY		0	130.7	0	0	0	0	0	130.7
400633	WHEELABRATOR FALLS INC		3.6	380.9	0	0	0	0	0	384.5
Waste Totals:			326633.9	37607.5	3607.6	6616.8	86959.8	10233.1	282.4	471941.1

County : CLARION

Permit	Disposal Facility Receiving Waste	Waste Type:	Municipal	Residual	Sewage Sludge	Infectious	Construction	Ash Residu	Asbestos	Total
100403	SENECA LANDFILL INC		28.8	105.7	28.5	0	51.6	0	0	214.6
100434	EVERGREEN LANDFILL		0	0	0	0	0.6	0	0	0.6
100585	NORTHWEST SANITARY LANDFILL		1483.2	1091.7	116.6	0	115.4	0	2	2808.9
101397	ADVANCED DISPOSAL SERVICES GREENT		40503.7	10082	1690.1	0	16.2	14.1	0.1	52306.2
Waste Totals:			42015.7	11279.4	1835.2	0	183.8	14.1	2.1	55330.3



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County Waste Destinations
in Tons (2000 lbs.) of Waste

For Year: 2011

County : CHESTER

Permit	Disposal Facility Receiving Waste	Waste Type:	Municipal	Residual	Sewage Sludge	Infectious	Contruction	Ash Residu	Asbestos	Total
100113	MODERN LANDFILL		0	6936.9	0	0	0	0	0	6936.9
100345	DELAWARE COUNTY SWA ROLLING HILLS		7806.5	0	0	0	221.9	0	0	8028.4
100346	PIONEER CROSSING LANDFILL		1847.3	518.9	0	0	317.6	0	0	2683.8
100944	CHESTER COUNTY SWA LANCHESTER LAN		241427.5	7727.2	2271.9	5460.9	16979.8	0	64.9	273932.2
100945	CUMBERLAND COUNTY LANDFILL		0	517	0	0	17686.1	0	0	18203.1
100955	CLINTON COUNTY SWA WAYNE TOWNSHIP		0	0	0	0	0	0	0.3	0.3
101069	S.E.C.C.R.A. LANDFILL		75763.8	2820.4	1283.3	0	26543.6	0	0	106411.1
101397	ADVANCED DISPOSAL SERVICES GREENT		0	23.7	0	0	2.6	0	0	26.3
101494	TULLYTOWN RESOURCE RECOVERY FACIL		4842.6	272.8	48.7	614.1	16	0	7.3	5801.5
101509	CONNESTOGA LANDFILL		9.2	25093.4	0	0	0	2698	18	27818.6
101538	SANDY RUN LANDFILL INC.		0	0	0	0	9179.9	0	0	9179.9
101571	MOSTOLLER LANDFILL INC		0	0	0	0	200	0	0	200
101680	G.R.O.W.S. NORTH		11.2	92.6	0	0	0	0	15.4	119.2
400558	COVANTA PLYMOUTH RENEWABLE ENERG		15.5	541.2	0	0	0	0	0	556.7
400592	LCSWMA RESOURCE RECOVERY FACILITY		0	433.9	0	0	0	0	0	433.9
400593	COVANTA DELAWARE VALLEY		55.2	47.1	0	0	0	0	0	102.3
400633	WHEELABRATOR FALLS INC		110.3	295.8	0	0	0	0	0	406.1
Waste Totals:			331889.1	45320.9	3603.9	6075	71147.5	2698	105.9	460840.3

County : CLARION

Permit	Disposal Facility Receiving Waste	Waste Type:	Municipal	Residual	Sewage Sludge	Infectious	Contruction	Ash Residu	Asbestos	Total
100277	TERVITA SANITARY LANDFILL		0	0	0	0	1.4	0	0	1.4
100403	SENECA LANDFILL INC		0	443.4	37.4	0	46.8	0	0	527.6
100434	EVERGREEN LANDFILL		0	0	0	0	11.6	0	0	11.6
100585	NORTHWEST SANITARY LANDFILL		1162.3	3962.6	77	0	40.8	0	0	5242.7
100620	IMPERIAL LANDFILL		0	0	0	0	5.8	0	28.2	34
101397	ADVANCED DISPOSAL SERVICES GREENT		41504.1	9082.7	1103.1	0	49.4	86.4	0	51825.7
Waste Totals:			42666.4	13488.7	1217.5	0	155.8	86.4	28.2	57643



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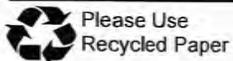
Note: This reports does not show waste shipped from Pennsylvania counties to out-of-state disposal facilities, nor does it show waste collected for recycling.

County Waste Destinations
 in Tons (2000 lbs.) of Waste

For Year: 2012

County : CHESTER

Permit	Disposal Facility Receiving Waste	Waste Type:	Municipal	Residual	Sewage Sludge	Infectious	Construction	Ash Residu	Asbestos	Total
100022	CHRIN BROTHERS SANITARY LANDFILL		0	0	0	0	48.8	0	0	48.8
100113	MODERN LANDFILL		0	2892.9	0	0	0	0	0	2892.9
100265	GRAND CENTRAL SANITARY LANDFILL INC		6.9	0	0	0	0	0	0	6.9
100277	TERVITA SANITARY LANDFILL		0	0	0	0	16.4	0	0	16.4
100345	DELAWARE COUNTY SWA ROLLING HILLS		7171.1	0	0	0	308.2	0	0	7479.3
100346	PIONEER CROSSING LANDFILL		1796.2	528.6	0	0	299	0	0	2623.8
100739	WESTERN BERKS COMMUNITY LANDFILL		14.9	145.3	0	0	1628.9	0	6.7	1795.8
100944	CHESTER COUNTY SWA LANCHESTER LAN		233576	12873.6	2262.8	2893.7	22746.6	0	55.1	274407.8
100945	CUMBERLAND COUNTY LANDFILL		22.9	1163.4	0	0	15844.9	0	0	17031.2
101069	S.E.C.C.R.A. LANDFILL		76077.2	2076.5	1311.6	0	22698.5	0	0	102163.8
101397	ADVANCED DISPOSAL SERVICES GREENT		0	47.9	0	0	0	0	0	47.9
101494	TULLYTOWN RESOURCE RECOVERY FACIL		0	291.9	39.1	281.7	6.4	0	0	619.1
101509	CONNESTOGA LANDFILL		0	31334.3	25.4	0	0	477.3	47.3	31884.3
101538	SANDY RUN LANDFILL INC.		26.7	0	0	0	6354.4	0	0	6381.1
101680	G.R.O.W.S. NORTH		0	10.2	0	0	0.3	0	0	10.5
400558	COVANTA PLYMOUTH RENEWABLE ENERG		24.3	720.4	0	0	0	0	0	744.7
400592	LCSWMA RESOURCE RECOVERY FACILITY		0	463.9	0	0	0	0	0	463.9
400593	COVANTA DELAWARE VALLEY		6.1	11.2	0	0	0	0	0	17.3
400633	WHEELABRATOR FALLS INC		109.4	349.7	0	0	1.8	0	0	460.9
Waste Totals:			318831.7	52909.8	3638.9	3175.4	69954.2	477.3	109.1	449096.4



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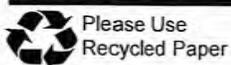
For Year: 2013

County : CHESTER

Permit	Disposal Facility Receiving Waste	Waste Type:	Municipal	Residual	Sewage Sludge	Infectious	Construction	Ash Residu	Asbestos	Total
100020	IESI PA BETHLEHEM LANDFILL CORP.		0	0	0	0	8.5	0	854.8	863.3
100022	CHRIN BROTHERS SANITARY LANDFILL		0	0	0	0	1.7	0	0	1.7
100113	MODERN LANDFILL		0	179.2	0	0	0	0	0	179.2
100345	DELAWARE COUNTY SWA ROLLING HILLS		6948.7	0	0	0	101.4	0	0	7050.1
100346	PIONEER CROSSING LANDFILL		1663.1	965.9	0	7.1	141.3	0	0	2777.4
100739	WESTERN BERKS COMMUNITY LANDFILL		0	385.3	0	0	0	0	117.4	502.7
100944	CHESTER COUNTY SWA LANCHESTER LAN		228960.6	4720	4906.2	0	23065.8	0	61.5	261714.1
100945	CUMBERLAND COUNTY LANDFILL		0	1517.2	0	0	20.4	0	0	1537.6
100955	CLINTON COUNTY SWA WAYNE TOWNSHIP		0	0	0	0	0	0	2.2	2.2
101069	S.E.C.C.R.A. LANDFILL		77493.4	1067.2	2052.2	0	23257.7	0	0	103870.5
101494	TULLYTOWN RESOURCE RECOVERY FACIL		0	201.5	37.7	0	0	0	0	239.2
101509	CONNESTOGA LANDFILL		0	6512.4	5.8	0	0	7.6	6.3	6532.1
101680	G.R.O.W.S. NORTH		5.9	177.5	0	0	2.8	0	0	186.2
400558	COVANTA PLYMOUTH RENEWABLE ENERG		0	479.5	0	0	0	0	0	479.5
400592	LCSWMA RESOURCE RECOVERY FACILITY		0	502.7	0	0	0	0	0	502.7
400593	COVANTA DELAWARE VALLEY		21.1	7.2	0	0	0	0	0	28.3
400633	WHEELABRATOR FALLS INC		0	346.3	0	0	0	0	0	346.3
Waste Totals:			315092.8	17061.9	7001.9	7.1	46599.6	7.6	1042.2	386813.1

County : CLARION

Permit	Disposal Facility Receiving Waste	Waste Type:	Municipal	Residual	Sewage Sludge	Infectious	Construction	Ash Residu	Asbestos	Total
100329	LAKE VIEW LANDFILL		0	14.1	0	0	0	0	0	14.1
100403	SENECA LANDFILL INC		0	191.2	19.3	0	0	0	0	210.5
100434	EVERGREEN LANDFILL		0	136.7	0	0	7.2	0	0	143.9
100585	NORTHWEST SANITARY LANDFILL		1228.1	1754.4	122.1	0	390.8	0	0	3495.4
100620	ALLIED WASTE SYSTEMS IMPERIAL LANDFI		0	0	0	0	20.8	0	56.8	77.6
101397	ADVANCED DISPOSAL SERVICES GREENT		37988.1	16254.5	918.9	0	293.4	141.3	184.5	55780.7
Waste Totals:			39216.2	18350.9	1060.3	0	712.2	141.3	241.3	59722.2



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Commonwealth of Pennsylvania
 Department of Environmental Protection
 Bureau of Waste Management
 Division of Reporting and Fee Collection

Note: This reports does not show waste shipped from Pennsylvania counties to out-of-state disposal facilities, nor does it show waste collected for recycling.

County Waste Destinations
 in Tons (2000 lbs.) of Waste

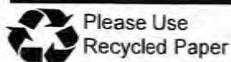
For Year: 2014

County : CHESTER

Permit	Disposal Facility Receiving Waste	Waste Type:	Municipal	Residual	Sewage Sludge	Infectious	Contruction	Ash Residu	Asbestos	Total
100020	IESI PA BETHLEHEM LANDFILL CORP.		0	0	0	0	25.7	0	550.6	576.3
100113	MODERN LANDFILL		0	71.2	0	0	0	0	0	71.2
100345	DELAWARE COUNTY SWA ROLLING HILLS		4982.2	0	0	0	50.9	0	0	5033.1
100346	PIONEER CROSSING LANDFILL		1957.6	959.5	90.2	0	116.5	0	0	3123.8
100739	WESTERN BERKS COMMUNITY LANDFILL		15.5	0	0	0	0	0	33.6	49.1
100758	HARRISBURG MATERIALS ENERGY RECYC		2.6	0	0	0	0	0	0	2.6
100944	CHESTER COUNTY SWA LANCHESTER LAN		226715.3	4574.4	4415.9	0	25471.8	3562.4	15.7	264755.5
100945	CUMBERLAND COUNTY LANDFILL		0	1499.7	0	0	1521	0	0	3020.7
100955	CLINTON COUNTY SWA WAYNE TOWNSHIP		0	0	0	0	0	0	0.1	0.1
101069	S.E.C.C.R.A. LANDFILL		73461.5	2968.3	1682.1	0	28851.7	0	0	106963.6
101494	TULLYTOWN RESOURCE RECOVERY FACIL		0	93.8	42.8	0	32.9	0	5.2	174.7
101509	CONNESTOGA LANDFILL		0	7585.3	0	0	0	0	28.4	7613.7
101680	G.R.O.W.S. NORTH		0	35	0	0	3.5	0	0	38.5
400558	COVANTA PLYMOUTH RENEWABLE ENERG		11.9	491.8	0	0	0	0	0	503.7
400592	LCSWMA RESOURCE RECOVERY FACILITY		0	489.5	0	0	0	0	0	489.5
400593	COVANTA DELAWARE VALLEY		0	34.2	0	0	0	0	0	34.2
400633	WHEELABRATOR FALLS INC		0	312.6	0	0	0	0	0	312.6
Waste Totals:			307146.6	19115.3	6231	0	56074	3562.4	633.6	392762.9

County : CLARION

Permit	Disposal Facility Receiving Waste	Waste Type:	Municipal	Residual	Sewage Sludge	Infectious	Contruction	Ash Residu	Asbestos	Total
100403	SENECA LANDFILL INC		0	161.3	0	0	0	0	0	161.3
100434	EVERGREEN LANDFILL		0	12.5	0	0	0	0	0	12.5
100585	NORTHWEST SANITARY LANDFILL		1204.7	1962.1	103.1	0	176.1	0	0	3446
100663	KELLY RUN SANITATION INC LANDFILL		0	19.1	0	0	0	0	0	19.1
100963	LYCOMING COUNTY RESOURCE MANAGEM		0	122.6	0	0	0	0	0	122.6
101397	ADVANCED DISPOSAL SERVICES GREENT		36971.6	27454	173.2	0	321.6	83.7	0	65004.1
Waste Totals:			38176.3	29731.6	276.3	0	497.7	83.7	0	68765.6



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APPENDIX B
CHESTER COUNTY C&D MATERIALS OUTLETS

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RECYCLING SITES FOR CONSTRUCTION DEMOLITION/LAND CLEARING DEBRIS

Organization Name and Address	Additional Information	Phone/Fax#
Accurate Recycling Dan Lasensky 10 IMS Drive Coatesville, PA 19320 4042 State Road, Malvern, PA 219 Quarry Road, Peach Bottom, PA 896 Elk Mills Dr., Elkton, MD	Asphalt Shingles Asphalt Shingles Asphalt Shingles Asphalt Shingles	(610) 623-3700
Armstrong www.armstrong.com/recycle www.armstrong.com/commerceilingsna/article45691	Acoustical ceilings, panels or tiles Free pickup in Chester County if 5 pallets or 7,000 sq. ft.(4'x4' up to 6' high in stretch wrap. Must be pre-approved. No friable asbestos	877-276-7876 press 1, then 8 Specify Register Confirm Remove-Option 1 Option 2 Call
Armstrong www.armstrong.com/recycle	Insulation – Facing or backing must be removed	877-276-7876 press 1, then 8
Richard S. Burns & Co. 4300 Rising Sun Ave. Philadelphia, PA 19140	Any non-hazardous materials. Wood, concrete, dirt.	(215) 455-3222
* Cedar Hollow Recycling 100 Paradise Street Phoenixville, PA 19460	Used concrete & asphalt (recycled aggregates).	(610) 983-0193
Chester County Solid Waste Authority 7224 Division Hwy, Narvon, PA 17555 (Rte 322 W)	Vinyl Siding, Clean Dry Wall, Treated & Untreated Wood	(610) 273-3771
Construction Waste Management 7333 Milnor Street Philadelphia, PA 19136 www.cwmanagement.net	Separation on Site Large builders	(215) 333-6505
Copelands 211 Beeson Ave. Hillcrest, DE 19809	Wood chips, small branches up to 1" in diameter and no longer than 3 feet. Will accept leaves and grass. May be a fee for branches.	(302) 764-9223 Jim Copeland

Organization Name and Address	Additional Information	Phone/Fax#
* T 7 W 5 Eldredge Transfer Station 898 Fern Hill Road West Chester, PA 19380	Cardboard and Construction & Demolition Call for information Scale house 610-430-7370	(610) 304-4256
G & A Clanton 350 Lake Road Avondale, PA 19311	Clean Concrete & Asphalt Not to be mixed together.	(610) 869-8971 Ken Truman
Gypsum Agri-cycle 832 Willow Road Lancaster, PA 17601 Plant – E. Donegal Twp. Marietta, PA	Drywall	(717) 426-1990 Donald Hess
Hargrove, Inc. 1507 State Street Camden, NJ 08105	Brick, block concrete & asphalt.	(856) 963-5888
Interstate Waste Services 575 Trestle Place Downingtown, PA 19335	Cardboard Call for more information.	(610) 873-4020
L & S Recycling, Inc. 884 Brook Road Conshohocken, PA 19428	Construction & demolition – Wood, drywall, shingles, masonry, metal and cardboard. Concrete also	(610) 828-5948
Penn Container 1020 Broadrun Road Landenberg, PA 19350	Call for information - Construction debris, appliances (no freon removal), site cleaning, tree stumps, tractor, truck and auto tires.	(610) 274-1306 Mercer Jones Fax: (610) 274-1307
Regency Polymer Services 1324 Brass Mill Road Belcamp, MD 21017 www.regencypolymer.com	Vinyl siding, PVC pipe, Aluminum	(410) 237-9190
Scotts Corporation 311 Reedville Road Oxford, PA 19363	Call ahead Brush up to 3" diameter, grass clippings (15% max. of total mix). Soil	(610) 932-4200 Joe Ambruso
Thrifty Pallet 789 Cedar Knoll Road Coatesville, PA 19320	Pallets, Shipping and Wood products	(610) 436-0142
USA-Gypsum 190A Texter Mountain Road Reinholds, PA 17569	Drywall	(717) 335-0379 Fax 717-335-2561 Terry@usagypsum.com
Winzinger Recycling 2870 E. Allegheny Ave. Philadelphia, PA 19134	Clean & separated: concrete, asphalt, brick, cinder block, clean wood, stumps & tree parts, leaves.	(215) 425-4422

DISCLAIMER: This listing is provided as a public service. No companies are endorsed or recommended. To add additional listings or make changes, please call 610-273-3771 *226.

APPENDIX C
C&D WASTE HAULING COST ANALYSIS TABLE

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**Estimated Transportation Costs from Geographic Population Center of Chester County to Selected Construction & Demolition Waste Processing/
Disposal Facilities**

<u>Selected C&D Waste Processing/ Disposal Facility</u>	<u>From Downingtown, Chester County PA</u>		
	<u>Est. Round Trip (Miles) In Miles</u>	<u>Est. Round Trip Hauling Cost</u>	<u>Cost/Ton</u>
Milton Grove C&D Landfill (Advanced Disposal), 2487 Cloverleaf Rd, Elizabethtown, PA	102	\$204	\$13.60 - \$20.40
Richard S Burns & Co., 4300 Rising Sun Ave., Philadelphia PA	73	\$146	\$9.70 - \$14.60
Cedar Hollow Recycling, 100 Paradise Street, Phoenixville PA	30	\$60	\$4.00 - \$6.00
Accurate Recycling, 4042 State Road, Malvern PA	26	\$52	\$3.50 - \$5.20
Construction Waste Management, 7333 Milnor Street, Philadelphia PA	93	\$186	\$12.40 - \$18.60
Gypsum Ag-Recycle, 832 Willow Road, Lancaster PA	66	\$132	\$8.80 - \$13.20
L&S Recycling Inc., 884 Brook Road, Conshohocken PA	60	\$120	\$8.00 - \$12.00
Penn Container, 1020 Broadrun Rd., Landenberg PA	44	\$88	\$5.90 - \$8.80
Winzinger Recycling, 2870 E. Allegeny Avenue, Philadelphia PA	74	\$148	\$9.90 - \$14.80

Note 1: All mileage shown is a round trip estimation from Downingtown to each site, using Mapquest.

Note 2: All transportation cost estimates are based on an average truck hauling cost of \$2 per mile, for comparison purposes. "Est. Costs" reflects hauling cost per truck per round trip, including labor, fuel and equipment. Costs do not include gate fees or revenues paid for materials.

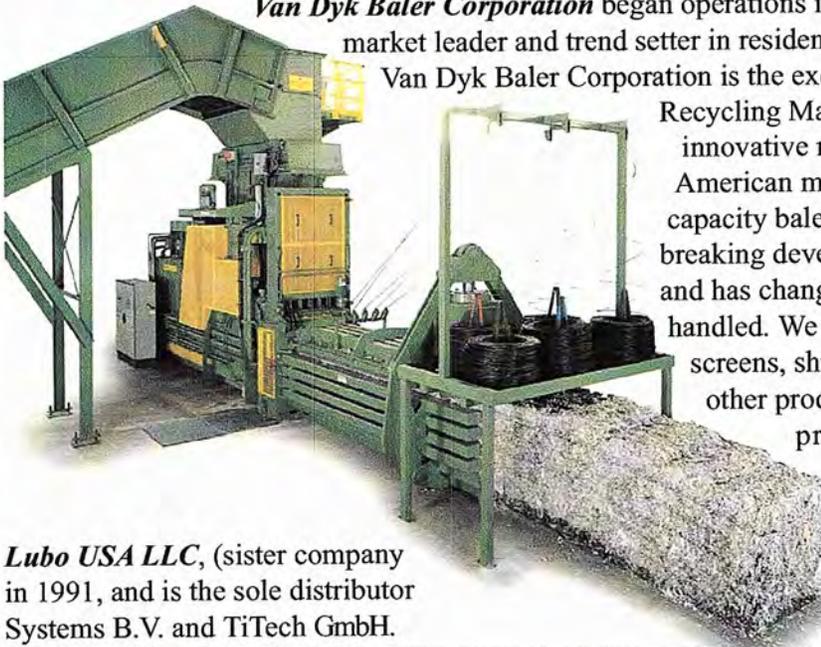
Note 3: Cost per ton is based on a truck payload range of 10-15 tons for relatively heavy C&D materials collected and direct-hauled to the processing or disposal site in a dump truck.

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APPENDIX D – PART 1
LUBOUSA GENERIC EQUIPMENT AND
SYSTEMS INFORMATION

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Van Dyk Baler Corporation began operations in 1984, and has since become the market leader and trend setter in residential and industrial recycling technology. Van Dyk Baler Corporation is the exclusive distributor of Bollegraaf



Recycling Machinery and continues to introduce innovative recycling technologies to the North American market. Bollegraaf is known for its high capacity balers, but is also known for its ground breaking developments in single stream processing and has changed the way curbside materials are handled. We supply balers, bulk feeders, conveyors, screens, shredders, air systems, magnets and many other products for the recycling and waste processing industries.

Lubo USA LLC, (sister company in 1991, and is the sole distributor Systems B.V. and TiTech GmbH.

to Van Dyk Baler Corp.) was founded for Lubo Screening and Recycling

and demolition processing systems have perfected the technique of material separation through the use of various automated processes. Lubo Starscreens, such as the angled sorter, ONP and OCC separators

have been integrated into Bollegraaf single streams and material recovery facilities around the world. The core of Lubo's success is in its patented stars which are available in various sizes and materials. Lubo stars have proven to increase the process efficiency for customers throughout the industry.



TiTech GmbH signed an exclusive partnership with Lubo USA in March 2004, to import and service their optical sorting technology. As the leader in optical sorting technology, TiTech uses infrared technology to

“scan” materials such as: mixed plastics (PET, PP, PVC and others), mixed paper, glass, and C&D materials. With this innovative technology, our systems can also sort by size, color, weight, and shape, which result in increased efficiency and lower labor cost.





WE'LL SORT IT OUT FOR YOU...

Van Dyk Baler Corp., Lubo USA and TiTech GmbH provide innovative and proven methods for solving all of your material recovery needs. Our goal is to design, fabricate, install and service equipment that assures a functional, cost-effective approach to material processing.



Bollegraaf Recycling Machinery has become a household name in the recycling industry as a developer and manufacturer of high quality machinery, systems and accessories. Bollegraaf's (fully automatic) balers, shredders, belt conveyors, starscreens and other products are proving their value every day all over the world. Bollegraaf can tailor-make a system for sorting and processing waste streams to fit in your building or to fit an existing system you may already have.



- * High capacity with little effort of employees
- * Long life through steady construction and interchangeable wearing parts
- * Slight pollution of recyclables material by using starscreens instead of rotoscreens
- * Slight standstill through easy interchangeable stars in the screens & other wearing parts
- * Turnkey project supplier
- * All parts are modular constructed into a custom-made sorting system
- * Over 40 years of experience provides a maximum knowledge in designing sorting systems.



Bollegraaf – BRM HBT-Series Chain Conveyor

Bollegraaf type HBT-1200 chain belts stand out because of their long life and low maintenance costs as a result of, among other things, their robust construction and the manner in which the belt supports are mounted.

The steel under-frame of the chain belt conveyors consist on both sides of 8 mm plates that are linked together with tubular sections. In turn, the plates are linked together lengthwise by way of 12 mm angle steel section that also serve as running surface for the chain. As a result, the belt construction is extremely rigid. The angle steel is kept for as long as possible insofar permissible for transportation. The wear and tear on the chain is therefore very limited and the noise level of the chain carrier very low. The U-shaped sections come with UNP-180 standards to which 3 mm thick side plating has been attached. The construction of the side plating is such that the material cannot form a bridge. The steel labyrinth seal between the belts and side plates ensures that no material can get into the chain. Two maintenance hatches have been provided in the under-frame. The whole running surface for the chain, the straight sections as well as the bent sections, can be replaced because they have been screwed to the under-frame.



The chain is a 6" hollow bolt chain with a roll diameter of 66.7 mm and a breaking strength of 24,000 pounds. Between the chains, box sections (100 x 60 mm, wall thickness 4 mm) have been screwed every 300 mm as belt carriers, to which the rubber belt is attached. The belt carriers can be replaced without interrupting the chain. The installation comes with chain wheels of 398 mm and with 8 teeth.

The chain belt carrier is driven by an SEW motor reductor mounted on the shaft. The drive shaft is mounted on two self-adjusting ball bearings. Rubber buffers protect the motor against initial jolts.



Bollegraaf Recycling Machinery has more than 40 years of experience designing and producing automated balers. Because of its pre-press flap, the unique HBC baler of Bollegraaf Recycling Machinery can be used for baling all sorts of materials.



Advantages compared to cutting balers

Balers with a pre-press flap offer various advantages compared to cutting balers:

- The pre-press flap ensures that a closed compaction channel is created, so paper types that are difficult to compact will not need to be cut off during baling.
- The pre-press flap also ensures that much more material is being baled in each cycle. The capacity of a baler is, with similar motor output, much greater than that of a baler with cutter.
- Because the baler doesn't have a cutter, maintenance costs are much lower because there are no knives that need to be replaced regularly and guide strips and wheels last a lot longer as a result of the reduced load.
- The material is spread more homogeneously through the bale, making the bale more compact and more rectangular. Such bales are easier to stack than bales coming from a cutting baler.
- The hopper is of the same width and depth as the compression chamber.

Fully automated operation of the compactor

When the material on the quarter-cylindrical pre-press flap has reached the desired feed height, the pre-press flap will open automatically. The pre-press flap will close again when the material has dropped into the compaction chamber of the baler. When the pre-press flap has closed, the ram will start compacting the material. At the same time, the baler will be filled again by the feeding belt. When the ram has reached the forward position, it will then return to its original position. While the ram is moving back, the pre-press flap will open again when the feed level of the baler on the pre-press flap has reached the desired level (detected by photo-electric cells). As soon as the ram is back in starting position, the pre-press flap will close again. The cycle is repeated until the bale has reached the desired length (the length can be pre-set).

The ram will then remain in the forward position. The wire tying installation will then pass through the ram to pull the wires up from the bottom to the top. Wires are picked up under and above the bale. When the wire through-passage installation is back in the top position, the wires will be cut and knotted together. When the knotting process is completed, the ram moves back again and the cycle is repeated.

It may happen that too much material is dropped at once into the feeder chute of the baler, making it impossible for the pre-press flap to close completely. In that case, the flap opens after a few seconds and the ram pushes the material forward, while the flap remains open. Once the ram has reached the rear position, the pre-press flap closes and the compaction cycle is repeated automatically.

Efficiency

Our years of experience have contributed to the extremely efficient design of the HBC balers. A number of features specifically ensure that the Bollegraaf baler with pre-press flap is faster than comparable balers with pre-press flaps.



When, for instance, the ram moves forward and it doesn't need to compact the material under high pressure yet, the hydraulic cylinder exits differentially. This means that oil that comes out on the rod side of the cylinder is being refilled on the bottom side of the cylinder. The ram will then move forward with extra speed, which requires little energy.

Because the compaction cylinder is equipped with an extra heavy rod, little oil is required during the return stroke, as a result of which the ram also moves back quickly. Opening the pre-press flap also takes place very efficiently: when the baler has been fed a big enough load, the ram will move back at the same time that the pre-press flap opens. The oil that comes back out of the ram is used for opening the pre-press flap. This means that opening the pre-press flap doesn't need extra time.



Patents

Bollegraaf machines are covered by various patents. The baler of Bollegraaf has two patents:

Firstly, Bollegraaf Recycling Machinery has a patent on the needle heads (United States Patent 5 255 597). Normally, balers' needle heads that pull the wires through the bales become very dirty. However, in Bollegraaf balers the unique construction of the guide wheels in the needle heads ensures that there is only a minimum of dirt in the heads.

Furthermore, Bollegraaf Recycling Machinery has a patent on the low-mounted compaction cylinder (United States Patent 5 832 815). When a baler is being filled, the heaviest material will always be at the bottom of the compaction chamber. While the material is being compacted, the ram has a tendency to lift on the rear side. Most manufacturers compensate for this by guiding the rear side of the ram. Bollegraaf Recycling Machinery has placed the gripping point of the cylinder head in the ram below the center. As a result, the ram will not lift and there is no friction between ram and guides. This will add to the compaction power of the baler.

Hydraulics: fewer leaks, low noise and less loss of pressure

The hydraulic unit is mounted at the rear of the baler. The hydraulic unit is of very compact construction. All valves have been mounted on a so-called manifold" block, as a result the number of pipes has been kept to a minimum. This reduces the risk of leaks.

The inside geared pumps that are found in the tank ensure low noise levels. The main movements of the baler are controlled by valves that have been mounted in the manifold block as cartridges.

These valves ensure that the oil doesn't get too hot and that there are few shocks in the hydraulic system. The whole hydraulic system has been set up in such a way that performance is very high. As a result there is little loss of pressure, which improves the compaction power of the baler. The (optional) oil cooler has a cleaning mechanism that works automatically. The oil temperature is controlled by a temperature switch that ensures the (optional) cooler switches on automatically. If the oil temperature gets too high, the baler turns itself off automatically. The oil level is also controlled; with the baler switching off if the oil level gets too low. The cylinders have been attached by way of a spherical hinge so axial forces are avoided and wear and tear on the bushes and guides is prevented.

Operation: convenient and simple

The baler is supplied with a switch box that comes with a Telemecanique PLC. This PLC ensures that the whole machine runs automatically. The main motor is equipped with a star-triangular switch that has thermal protection and an automatic safety fuse. The other motors are protected against overload and short-circuiting. For the purpose of maintenance, it is possible to control all functions manually.

Operation takes place via a Telemecanique control panel that controls all functions of the machine. The functions, counters and any possible faults are shown on the panel display.

Preferred settings can be set for 10 different types of material. These default settings contain the following parameters, among others:

- Description of the material type
- Bale length
- Machine settings
- Bale counter
- The number of knots in the wires

You can always change these settings to suit your specific wishes.

The control panel will also show:

- Cycle of the 10 last bales produced by the machine
- Hours of operation
- Total number of bales

By way of a key switch, the bale counter can be reset any time you wish (for instance, at the end of the week).



All limit switches, level switches and valves are linked via a so-called ASI-bus system. This means that there is just a single cable that connects all these components to the PLC. The risk of a breakdown is limited.

The switchbox meets the NFPA 79 (Electrical Standard for Industrial Machinery) and NEC (National Electrical Code) standard.

The electrical box and the components contained in it are designed for air temperatures of 0° C to a maximum of +40° C.

LUBO Starscreens

The Starscreen™ is a mechanized screen made up of extremely durable rubber stars mounted on shafts. The stars rotate, screening on smaller fragments while allowing larger material to pass over the Starscreen. Its principle was based upon screening potatoes in Holland where the heavy clay needed to be screened off the potatoes without damaging them. Rubbers flexible stars are mounted on a fast rotating shaft and many shafts in a row form a high speed and efficient screening surface. Since each star creates a miniature throwing motion, materials get bounced over the screen. The pockets in between the stars are the effective screening surface and with a higher rotation speed of the star, the screening size becomes smaller. With all the



LUBO starscreens, the speed controls allow for a screen size variation of 20% smaller to 20% larger screen size. For instance if a screen deck is set at 2" minus, we can screen at high speed as small 1.5" and as coarse as 2.5" when we run the decks at a slower speed.

Sizes:

LUBO uses several different size stars, as small as 6 "(165) in diameter to as large as a car tire (660).

The smaller stars are typically being used to screen fines, dirt down to a 3/8" size. Material that needs to be screened smaller (1/4") we prefer to do with a flexible deck screen. The largest stars are typically used to do the initial separation in a C&D sorting system. With this monster screen we can handle the initial mixed C&D and separate the 24" and larger fraction. This means that oversized items such as wood, large concrete, large trash is separated from the bulk of the "easier" materials. The smaller fraction goes into our automated system with smaller screens to remove dirt and ADC, aircsystems to remove the light trash and optical technology to separate the plastics, Gypsum and paper. We prefer our high speed floatation tank to separate the wood from the inert.



Advantages of starscreens:

Capacity: Starscreen operate at a very high capacity since the screens run at fast forward speeds (up to 600ft/min) and the material gets opened. End result is capacities that are 4 to 6 times higher than shaking screen or trommels.

Screening motion: Very dynamic motion on the screen causes material to open up, release and screen. Every inch of the screen is used as an effective screening area. High rotation speed of the stars will reduce blinding due to wet materials. Self cleaning rubber fingers wipe the screening surfaces at every rotation.

Abuse friendly: Since our screens are outfitted with rubber stars, heavy material such as rock, concrete that falls onto the stars are cushioned and therefore don't break bearings, shafts, etc. The rubber stars are actually the reason why C&D materials don't get stuck in the screen. Instead it forces material over or pulls it through the deck. The "give" of the stars, will prevent a lot of downtime in comparison with other screens that use fixed screen dimensions. Our LUBO 660 Prescreen, routinely handles concrete pieces as heavy as 500lbs each and oversized materials as large as 6" wide and 10 ft long.

Size: Even our largest Starscreens are low profile and can be placed on an incline so valuable height can be maintained or increased. Since each shaft is balanced the entire screen is vibration free and does not need any expensive footings or foundations.

Self cleaning: With the high rotation speed of the flexible stars, very wet materials can be screened without plugging the screen surface. Starscreen can typically handle double the moisture content than comparable screening technologies.



Lubo Vibratory Feeder

The feeder is constructed in an in-bunker design, specially made for loading with a wheel-loader or a hydraulic excavator. The feeder is driven by a motor reducer, and by means of a frequency control, the infeed speed can be adjusted to control infeed capacity to system. The primary function of vibratory feeder is a durable and effective method for assisting in the controlled metering of material into system.

- Drive : 11 kW
- Speed : variable by means of frequency control
- Chute : included



Lubo Water Bath Separator – WBS

The water bath separator exists of a process tank where light materials (lighter than 1000 kg/m³) are separated from the heavier materials. The separation takes place in the process-tank where by means of a waterflow the floating-materials are pushed onto a 165 Starscreen (screen-size: 0-10mm) which rapidly carries the light fraction out of the tank. The fine fraction that fall through this screen still contains water. This fraction will fall onto a Waterscreen, where most of the water will be taken away from the small elements. The over-fraction of the Waterscreen will be joined with the over-fraction of the Starscreen, and the water flows back into the de-sinking-tank. The



de-sinking tank is divided into a number of compartments where the water flows through and than is pumped back into the process-tank. The water is blown as a cross flow over the infeed and heavy fraction to get out the light fraction as quick and efficient as possible. The starscreen carries the light fraction out of the tank very rapidly, to ensure high capacities. The waterflow is on several points adjustable by means manual valves.

The maximum capacity of this Water Bath Separator is app. 50 tons per hour with a maximum of the floating fraction of 20 tons per hour.

Specifications pump:

Type pump	: Slurry water-pump, with a special rubber-lining
Capacity	: Max. 300m ³ per hour
Power	: 30kW



Specifications discharge belt, heavy parts:

Rubber belt conveyor with a width of 4'7" with a effective working width of 3'10". At the end of the conveyor (outside the tank) there is a tension-adjuster mounted.

Drive	: 3,7kW
Belt type	: EP315/3 - 4+2, executed with 4" ripples
Drums	: crowned, diameter ca 250 mm, executed with an anti-skidcover
Side guide	: Side guides with squirt-nozzles (connects to the side of the tank)

The profit of a rubber conveyor instead of a chain conveyor is that long parts do not affect the continuity of the separation system.



Specifications 165 Starscreen®:

Starscreen® with a screen-length of app. 8'2" and a screen-width of app. 3'11". The Starscreen® is executed with Ø165mm. Lubo stars.

Drive	: 1*5,5kW
Isolation class	: IP55
Speed control	: variable by means of frequency control
Screen size	: 0-10mm. (variable by means of speed control)

Specifications waterscreen:

Type	: dynamic vibrating screen, with imbalanced motor
Width	: app. 3'11".
Length	: app. 6'7" – 9'10". (Depends on type)
Drive(s)	: 2*2,8kW
Screen size	: app. 1 mm

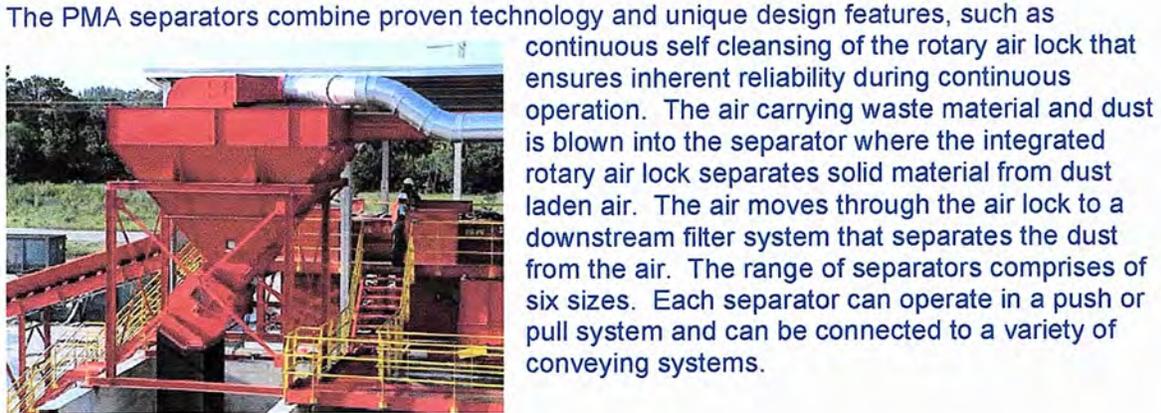
Waterstorage / buffertank:



The water storage tank is a necessary item for a proper working of the waterbath separator. The water storage tank stores all the process water, when the water bath separator is shut down. During colder seasons pumping avoids freezing of water. When started up the waterbath separator, approx 7000 liter water is pumped from the storage tank to the process tank. During operation process water cycles from the process tank to the water storage tank which is equipped with 3 compartments. In the last compartment a high flow circulation pump is connected to pump the water again to the process tank.

In the last compartment a removable cage box is positioned in front of the suction pipe. Once in a while the water storage tank needs to be cleaned by digging out deposits with an excavator. The dividing walls are removable by crane hooks at the top.

Hocker Air Systems



Air Separation System Capacity – 6,000-12,000 lbs/hour

Fan, directly driven by a motor

Fan	: capacity 6,000 lbs/hr nominal – 12,000 lbs/hr peak
Volume	: 13800 m3/hour
Pressure differential	: 3550 Pa
Inlet / outlet connectors	: 1'6"
Motor	: 22,0 kW, B3, IP53, 2930 rpm
Noise reduction	: Vibration silencer

Material-separator

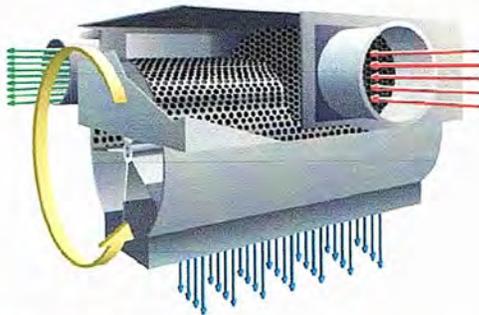
The material-separator consists out of a casing made of plate-steel with an integrated screen and turn-valve. The waste, dust and air will be blown into the material-separator. The heavy materials will be transported by the turn-valve. A specially built screen will screen the dust, and most of the dust will be separated from the airflow. In a filter-installation the remainders will be filtered out and clean air will flow back into the installation.

Air quantity	: 20000 m3/hour, maximum
Dimensions L x W x H	: 7'1" x 5'3" x 5'9"
Motor	: 0,75 kW, IP54, 6,1rpm
Weight	: Approx. 3,000 lbs
Material chute	: Included

Piping : *abrasive*

To nozzle/filter	: 2 mm thick, 66' long
To fan	: 4 mm thick, 66' long
To separator	: 4 mm thick, 66' long
Diameter	: 1'4"
Mounting materials	: Included
Material	: zinc-plated





<u>Sifter</u>	:	1200 mm approx.
Material	:	3mm, metal steel plate
Color	:	RAL
Control valve	:	Included
Nozzle	:	Included
Inspection window	:	2

Filter installation

Filter area	:	105 m2
Filter hoses	:	70 x 11'6"
Collection container	:	3 x 3'3" high
Vibrator shake-off	:	0,18 kW
Outgoing connector	:	1'4"
Dimensions L x B x H	:	6'6" x 6'6" x 18'8"

Switchbox

Housing	:	Dust tight, sheet metal (IP54)
E-connectors	:	22,0 kW, 0,75 kW, 0,18 kW
I/O connection	:	2 Potential free contacts



Bakker Overbelt Magnets

The top belt magnet is used to divert material on conveyor belts. To this end, the magnet is suspended above the conveyor belt, so that the magnet can remove ferrous parts from the passing flow of materials. These iron parts are pulled by the magnet on the belt of the top belt magnet. When this belt has passed the magnetic sector, all the parts fall into a receiving bin, bunker or onto a conveyor belt or something similar.

The magnet is protected on the active side by a stainless steel wearing plate. The top belt magnet has a powerful permanent magnet. The top belt system has a synthetic rubber cloth with vulcanized carriers and is self-guiding due to the use of curved drums. The belt has a belt-tensioning system.

Type HBM 28.045

Type	- top belt system type BVP.
Total length	- 7'6"
Magnetic part	- 6'1" x 3' x 1'4"
Diameter drums	- 1'8"
Drive	- slip-on gear motor SEW
Power	- 3,70 kW
Supply	- 480 VAC, 60 Hz
Belt	- synthetic rubber with vulcanized carriers. - Make : Continental; type Transconti.
Belt width	- 3'5"
Surface treatment	- anti-corrosion primer - varnish finish : RAL 6011 (reseda green)
Weight	- 2.135 kg

The magnetic part is made up of anisotropic ceramic magnets; BM8 quality.
With a CE label.

The Magnet is equipped with:

- Protection
- A support



Bakker Eddy Current Separator

In an eddy-current separator, use is made of electric conductivity and relative density of the parts to be separated. An eddy magnetic field is generated by magnets that rotate quickly. This causes an eddy in metal particles that pass the field. This eddy causes an opposite magnetic field. As a result of the repellent effect of the two magnetic fields, metal particles can be moved and thus separated from the flow of material.

The Eddy Current is made up of:

- a belt conveyor
- a magnet system

Belt conveyor:

The belt conveyor is sturdily built and placed on 2 steel supporting tubes 75 x 150 x 6 mm. The connecting tubes between the supporting tubes have been placed in the system. The advantage of this is that no material can pile up under the belt. The tubes have 4 mounting plates at the bottom. At both ends, the supporting profiles have mounting plates so that the modular separation units and/or vibrating feeds and magnetic drum system can be assembled.

The belt conveyor has a dust seal on two sides at the top and bottom, as well as at the drive and return drum. Dust seal material: Siegler Movo 60 NA.



An emergency stop switch has been placed on both sides of the belt conveyor, with a key reset, that activates the brake system. A vibration detector has been placed on the frame to detect any imbalance. If it does detect any, it automatically switches off the system. In that case only authorized personnel can switch the machine back on again.

Magnet system:

Consists of a high-speed induction roller with a stainless steel outer jacket, housed in the belt's return roller. The rotational speed is continuously variable and has a setting range of 0 to 3,000 rpm. The rotational speed is electronically limited to a max. rotational speed of 3,000 rpm, but the tested motor speed is 3,500 rpm. The magnetic part is made up of extremely strong neodymium magnets, BM 35 quality. The magnets applied have a radius to achieve as small an air gap as possible. The pairs of poles have been optimized.

TiTech Optical Sorters

TiTech's sorting technology enables fully automated separation of recyclable materials. The input material is transported through the sensor area on a conveyor belt. The sensors identify properties such as shape, structure, color, density and spectral behavior, as required, to determine the material. The predefined target materials are pneumatically sorted out at the end of the conveyor belt by means of a nozzle system.



TiTech provides a complete product portfolio that facilitates successful sorting in the following different sorting tasks:

TiTech PolySort®

Sorts objects by material types (*PET, PE, PVC etc.*)

TiTech ColourSort®

Sorts objects by color (*transparent, light blue, natural color etc.*); also recognizes material types

TiTech PaperSort®

Sorts different grades of paper (*brown carton, printed carton and paper etc.*)

TiTech Autosort

Flexible system that is prepared for all above-mentioned tasks

TiTech Finder®

Sorts objects by metal properties (*e.g. stainless steel from mixed metals*)

TiTech Combisense®

Sorts objects by colour, shape and size as well as by metal properties (*e.g. separating aluminum, copper and high grade steel; numerous other application areas*)

TiTech X-Tract®

Sorts objects by their specific atomic density (*e.g. CRT glass; sorting independent of color, shape, moisture and pollution level*)

Our products can be supplied with a width ranging from 600mm to 3000mm. We also offer many options and 'add-ons' that include different resolutions (depending on the size of the objects to be detected), valve block types and configurations. Please check each individual product sheet for further details.

At TiTech, we pride ourselves on producing simple to use and easy to install systems. Furthermore, they are low maintenance and a modem connection secures online system inspection and software downloads. TiTech's systems Mean Time Between Failures (MTBF) stands at seven thousand hours. This means that our products will ensure your operation runs both highly smoothly and highly efficiently.

TiTech core system components comprise:

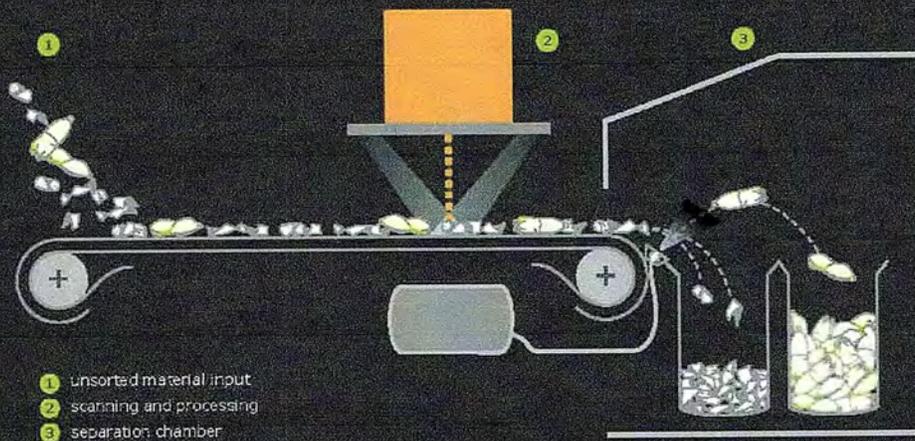
- Detection system (scanner) with lamps
- Control panel with modem
- Valve block(s) and air regulator
- Accompanying documentation (this is available in English, German, Spanish, Italian and French)

Sorting with TiTech means

- Innovative technology – selection of between 6 different sensors
- High purity – up to 98 %
- High efficiency – up to 95 %
- High precision – even the smallest of particles are recognized
- High throughput performance – up to 30 metric tons per hour, depends on application and material



INNOVATIVE SORTING

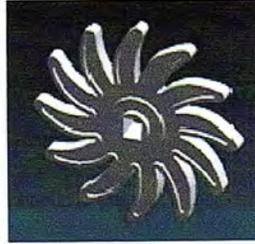


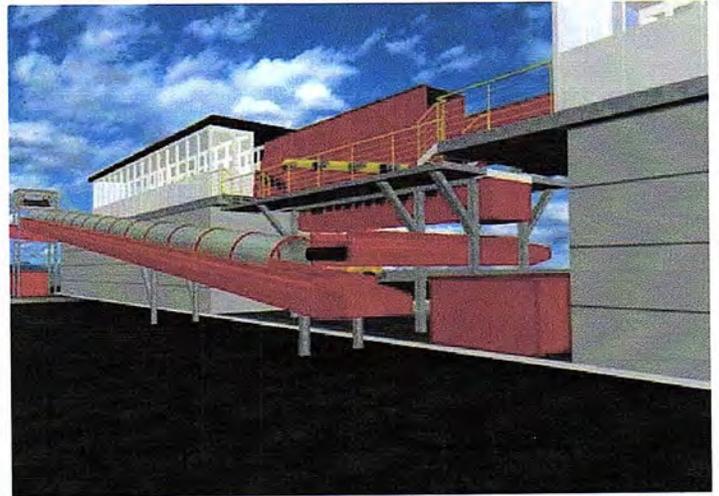
TITECH's sorting technology enables fully automated separation of recyclable materials. The input material is transported through the sensor area on a conveyor belt. The sensors identify properties such as shape, structure, colour, density and spectral behavior, as required, to determine the material. The predefined target materials are pneumatically sorted out at the end of the conveyor belt by means of a nozzle system.

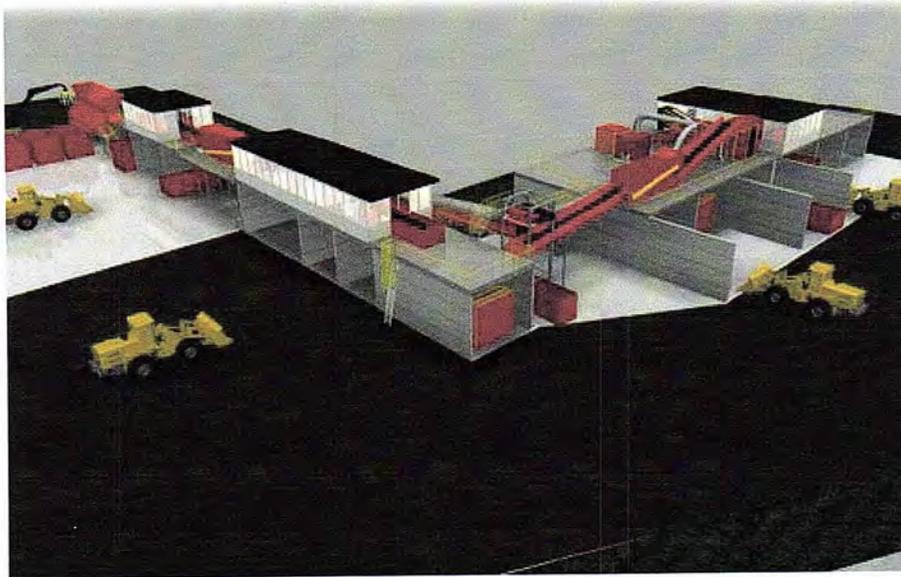
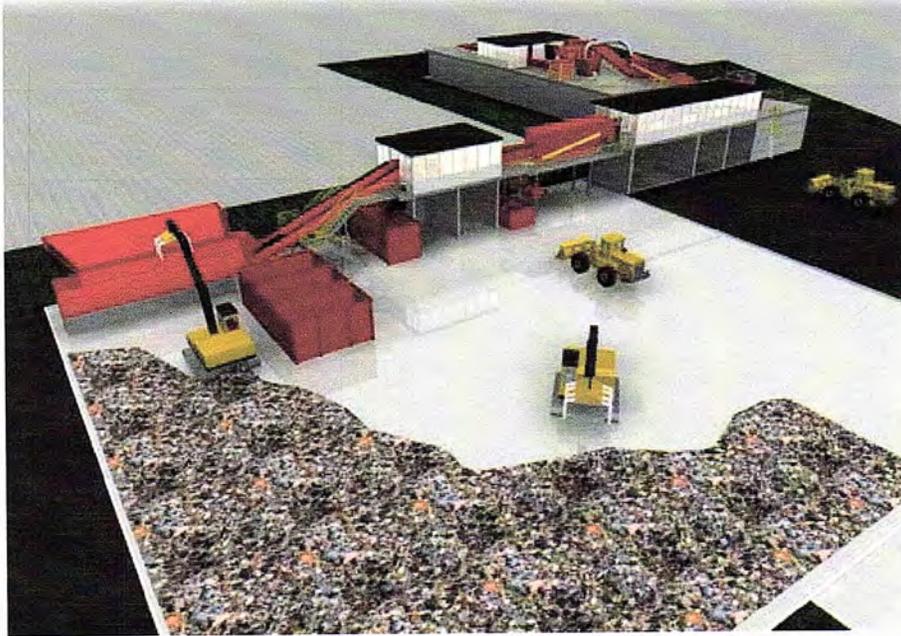
APPENDIX D – PART 2
LUBOUSA GENERIC EQUIPMENT AND
SYSTEMS INFORMATION

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Lubo Material Processing & Recovery Systems for Mixed Construction and Demolition Waste





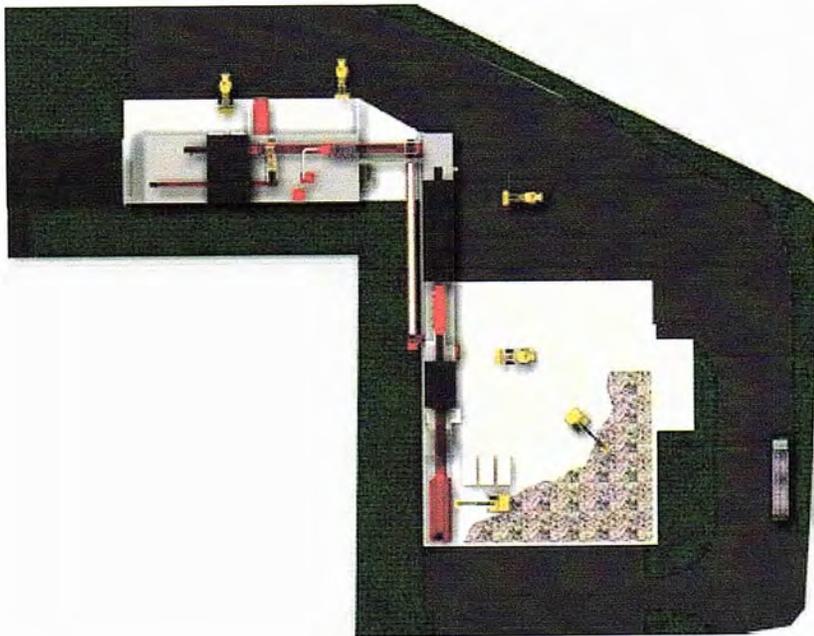






Lubo Systems
SCREENING & RECYCLING

lubo-usa





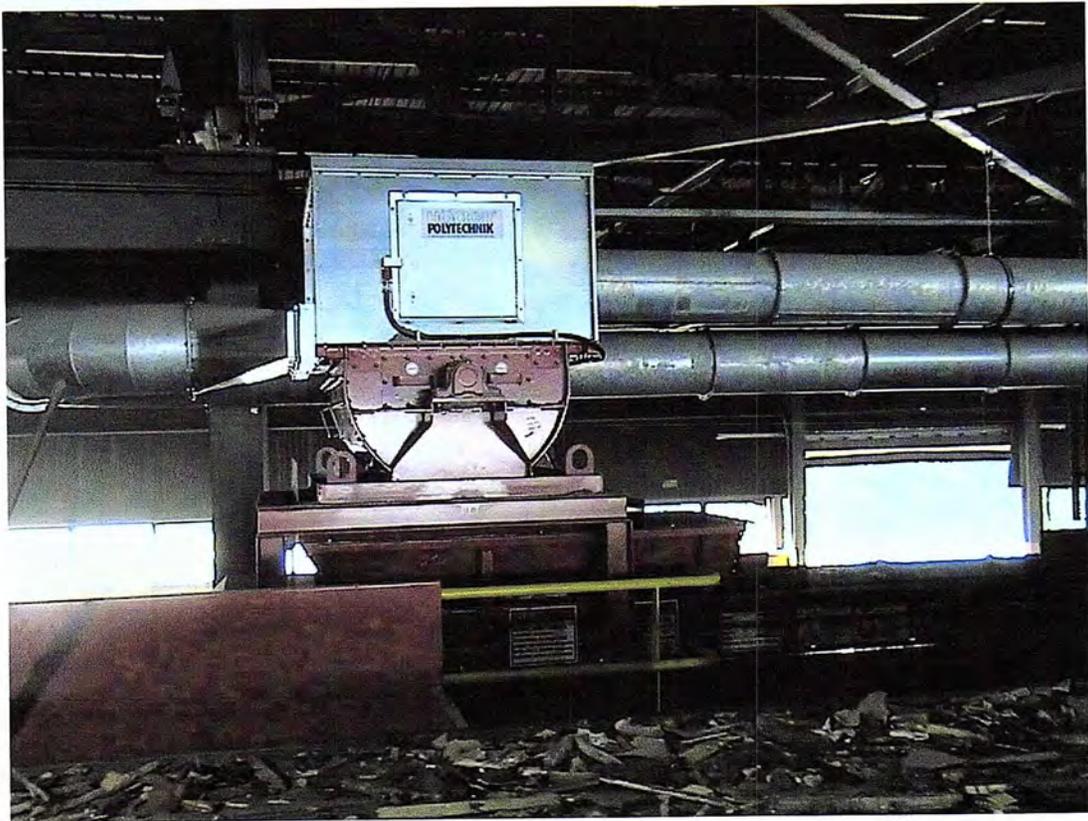
Lubo Systems
SCREENING & RECYCLING

lubo-usa











Lubo Systems
SCREENING & RECYCLING

lubo-usa









Lubo Systems
SCREENING & RECYCLING

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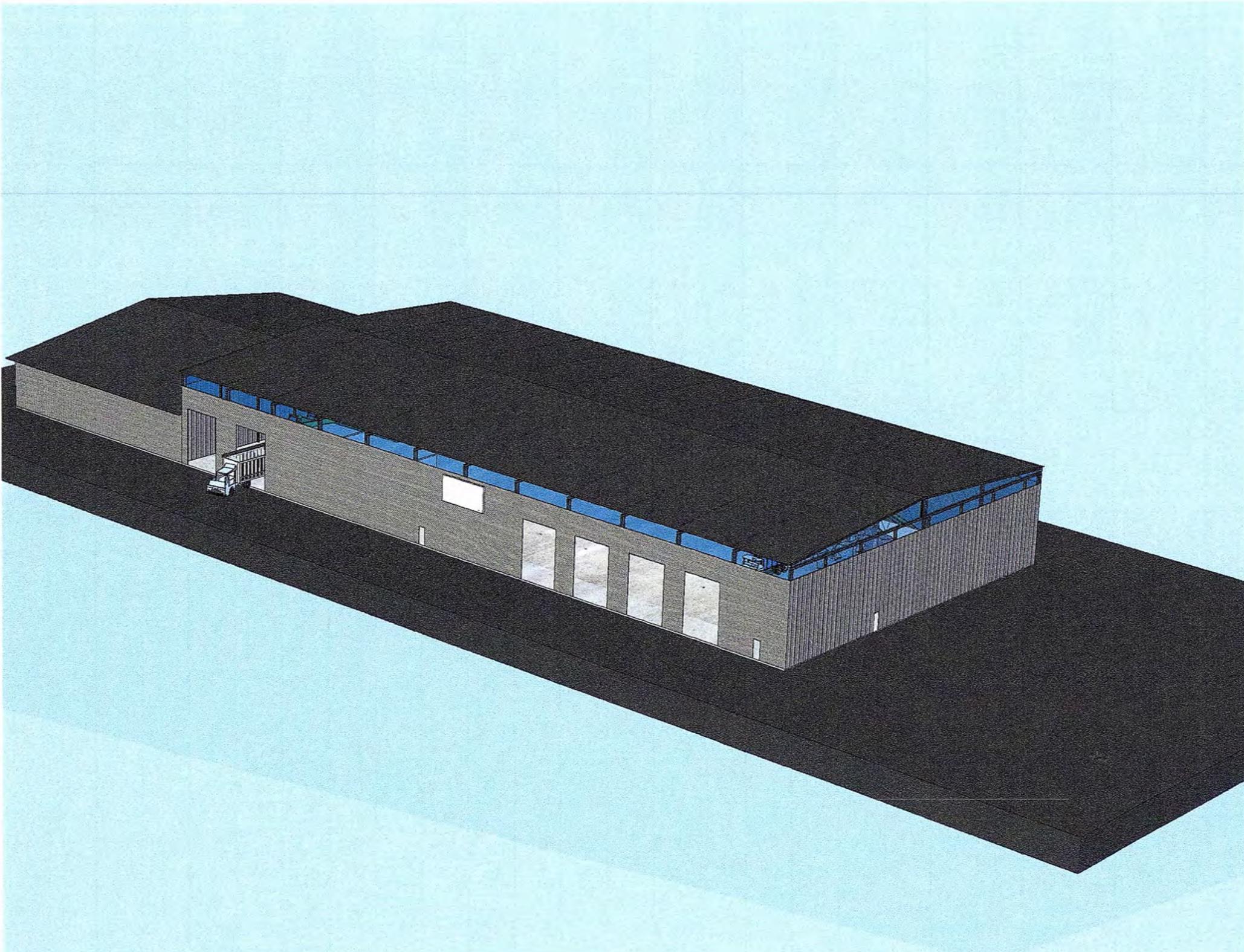


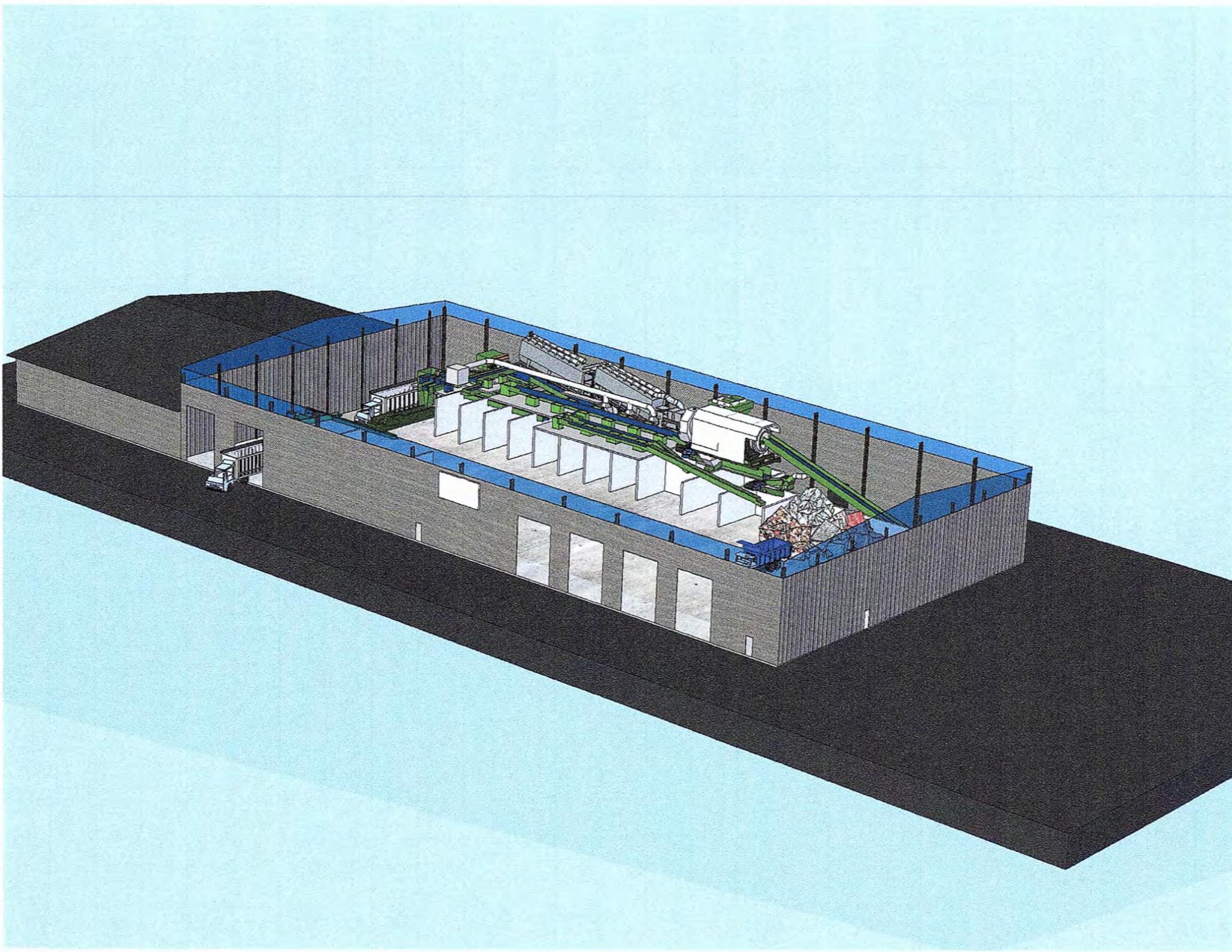
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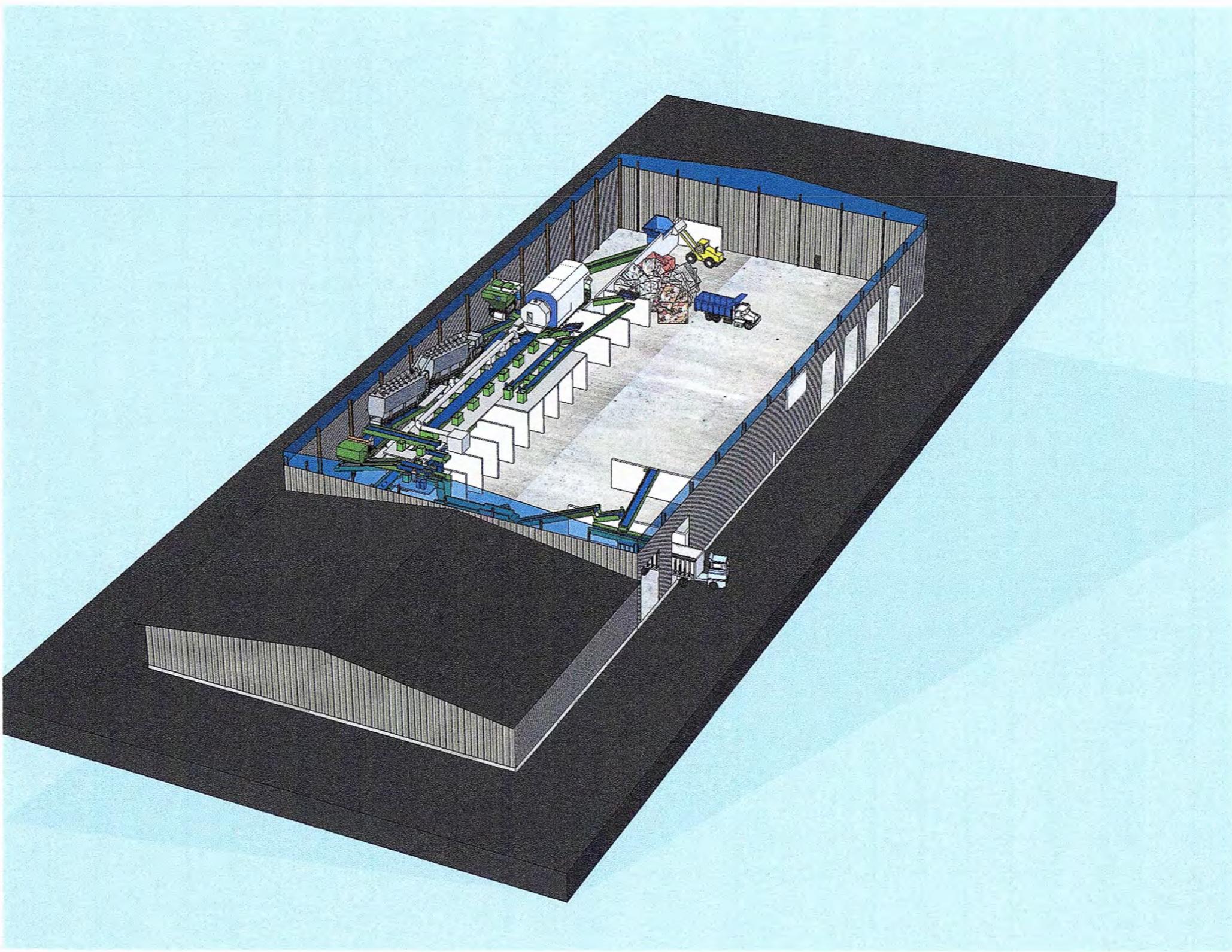
APPENDIX E

**CHESTER COUNTY LUBO C&D PROCESSING
FACILITY CONCEPT LAYOUT**

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APPENDIX F

**CHESTER COUNTY LUBO C&D PROCESSING
FACILITY PER TON OPERATING COST
ESTIMATE**

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