Kennedy Space Center
Diverted Aggregate Reclamation and Collection Yard (DARCY) Operation Plan



Prepared by:

Amentum Spaceport LLC
Kennedy Space Center, Florida 32815-0237
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PURPOSE

The purpose of this plan is to document roles, responsibilities and operating procedures for the Diverted Aggregate Reclamation and Collection Yard (DARCY). The DARCY was established to provide a diverted construction and demolition (C&D) material consolidation and processing area at Kennedy Space Center (KSC) for salvageable C&D waste (aggregate and concrete) destined for disposal at the KSC Class III Landfill. The DARCY is located on Schwartz Road (See Figure 1) adjacent to the KSC Class III Landfill.

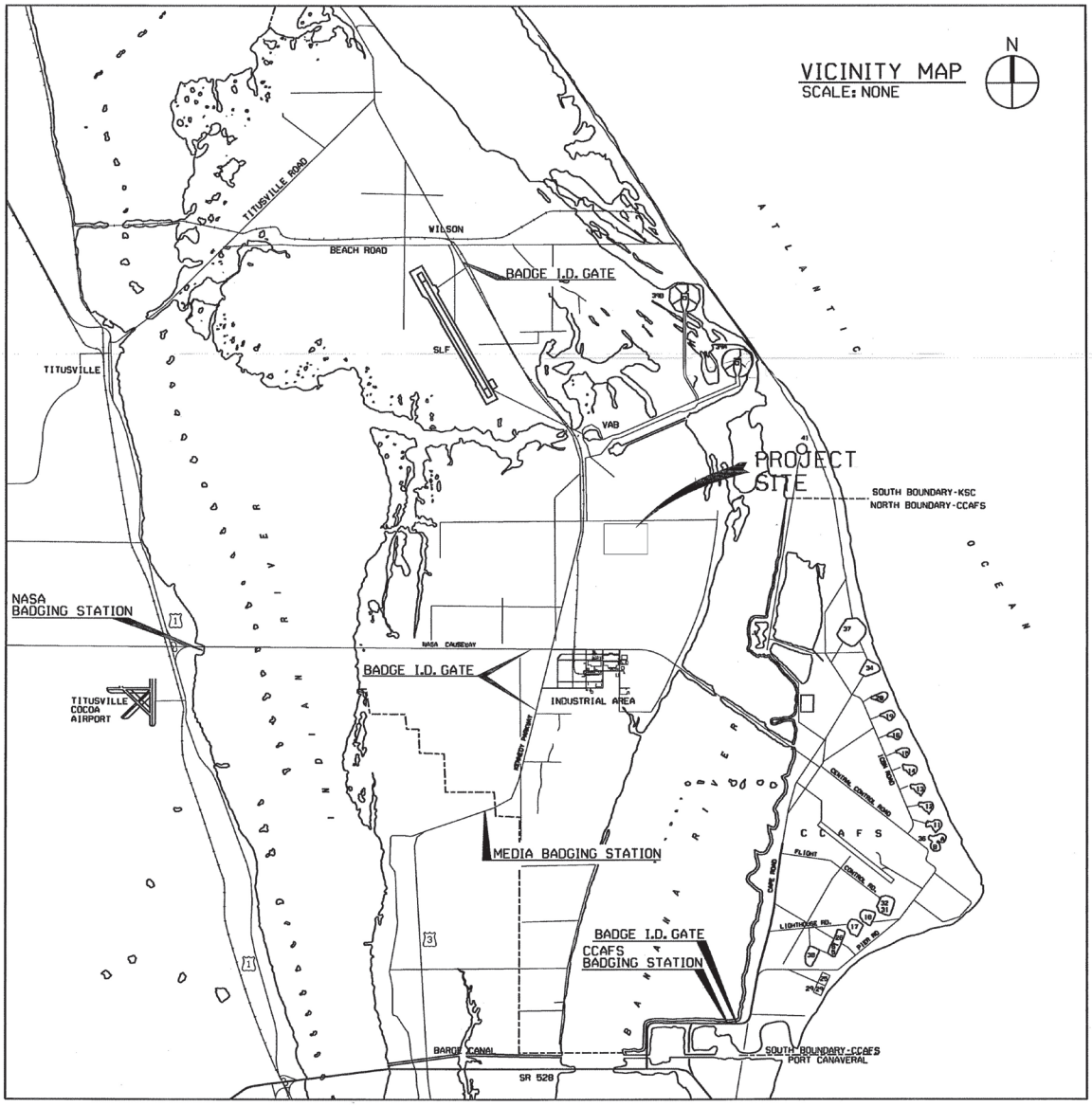

Figure 1, KSC DARCY and Class III Landfill Site

SITE DESCRIPTION

The DARCY is a cleared, 10-acre parcel of land north of the closed KSC Landfill and west of the active KSC Class III Landfill located on Schwartz Road with which it shares an entrance (see Figure 2). The facility provides storage and processing areas for the recycling and reuse of waste concrete and other aggregate based materials (excess river rock, limestone gravel and residual soils) produced from construction and demolition projects occurring on KSC. The DARCY reclaims and collects recyclable concrete and other targeted aggregate materials diverted from land-based disposal. The collected concrete materials are processed or crushed on-site into a valuable renewable resource. The processed or excess materials are available to contractors on KSC for use in construction and maintenance projects.

To prepare the site for initial operation, all vegetation was cleared to ground level through the use of a Gyro-Track rotating grinder. The surface was not disturbed during this process and the mulched vegetative materials were left on-site to prevent soil erosion. Over time, a number of small roadways were stabilized for use by heavy equipment and industrial rated dump trucks. The stabilization was accomplished by using only porous materials to discourage storm water runoff and encourage natural infiltration.

BACKGROUND

Executive Order 13834 "Efficient Federal Operations" affirms that federal agencies reduce waste generation through waste prevention, recycling and affirmative procurement. It requires agencies to annually divert at least 50 percent of non-hazardous C&D debris and requires agencies to divert at least 50 percent of nonhazardous solid waste, including food and compostable material, and to pursue opportunities for net-zero waste or additional diversion. As C&D waste streams account for approximately 65% of all waste generated on KSC, it is essential that KSC reduce the amount of C&D waste discarded through methods such as waste reduction, reuse, and recycling.

Recycling of concrete and aggregate material found in C&D waste on-site has been identified as a viable diversion method that provides the benefits of:

- Reduced use of landfill space;
- Lower costs for heavy materials hauling;
- Less wear and tear on roads and equipment;
- Decreased energy costs for transportation vehicles;
- Reduction of green house gas emissions associated with transportation;
- Reduced cost of road base material:
- Earned credits for the LEED Green Building Rating System.

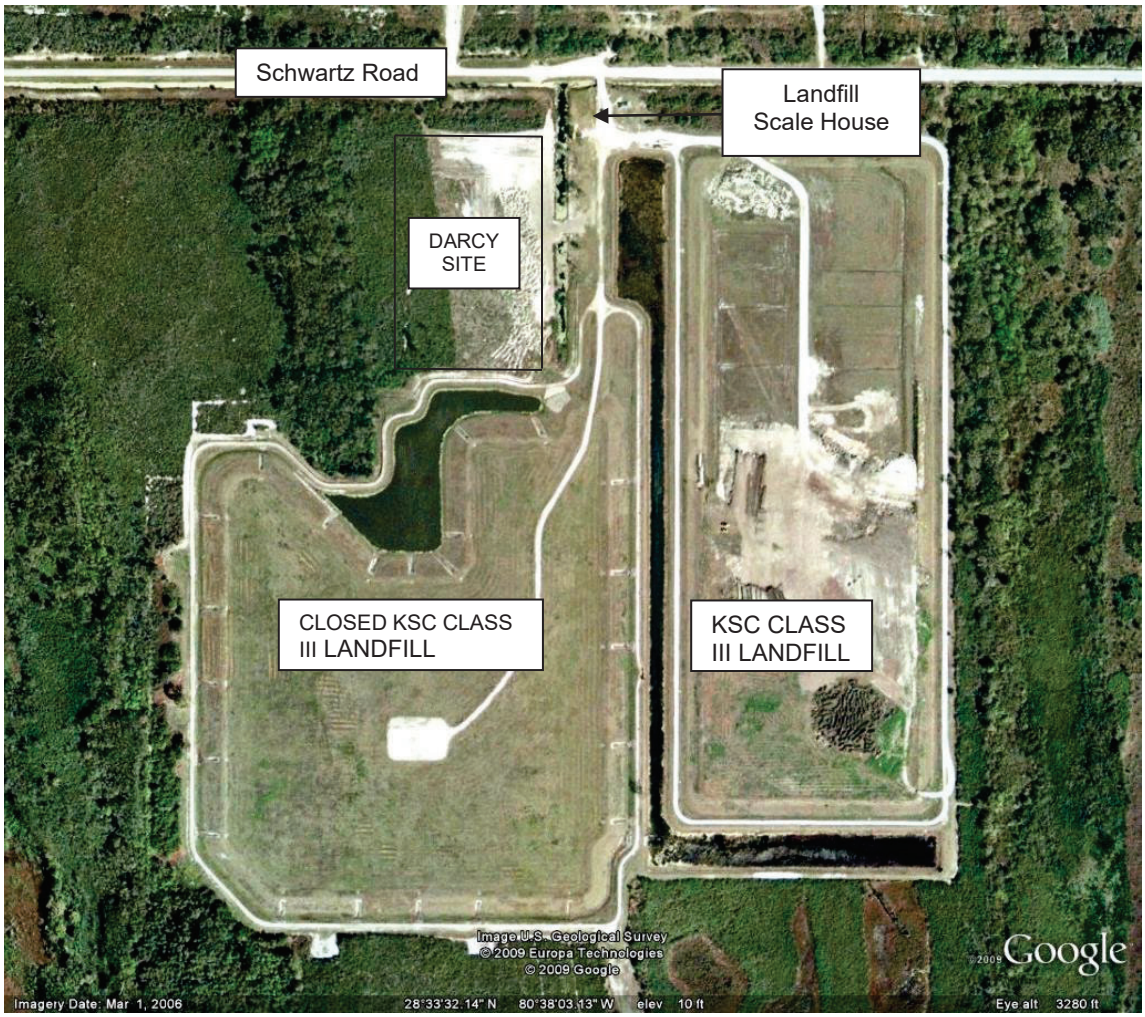

Figure 2, KSC DARCY Site Aerial Photo

ROLES AND RESPONSIBILITIES

NASA Center Operations Directorate: Responsibility for the operation of the DARCY facility rests with the NASA Center Operations Directorate. The DARCY Engineer located within the Facilities Operations and Maintenance Branch of the Center Operations Directorate initiates contracts with offsite vendors for concrete crushing and material classification once enough recycled concrete waste material has accumulated to make it economical and monitors performance of the DARCY processes. The Environmental Assurance Branch (EAB) within the Center Operations Directorate is responsible for addressing any regulatory compliance issues that may arise.

NASA KSC's Operation and Maintenance Contract (KSC OMC or contract): Limited day-to-day support of the DARCY is provided by the contract. Landfill Operations personnel monitor the scale house to weigh and record aggregate material

entering the DARCY and processed aggregate material leaving the DARCY for reuse. Material entering the DARCY is checked by Landfill Personnel for hazardous and other non-suitable materials. BOSS also maintains access for equipment and vehicles within and to the DARCY site. Residual soil material generated from the diverted concrete waste processing is removed by contract for use at the KSC Schwartz Road Class III Landfill for cover as needed and for the construction of containing berms (lifts) to meet existing permit requirements. The contract Quality, Safety and Environmental Division (QSE) is responsible for monitoring environmental compliance for the contract work performed to support DARCY operations.

Construction and/or Demolition Project Manager: The project managers for Center construction or demolition projects delivering diverted concrete waste or other approved aggregate materials to the DARCY are responsible for ensuring that the materials are free from contamination and suitably segregated per NASA Facilities Operations and Maintenance Branch direction to allow effective processing.

Concrete and Aggregate Processing Contractor(s): The NASA Concrete and Aggregate Processing Contractor(s) (various companies are used) are responsible for crushing concrete to generate aggregate materials, classifying and screening aggregate materials and recycling metal rebar by-product as directed by contract. The Contractor is responsible for maintaining safe and environmentally compliant operations and for initiating emergency procedures and reporting non-compliance incidents to NASA in accordance with contract requirements.

PROCESS DESCRIPTION AND INFORMATION

Aggregate

The most widely used building material in Florida isn't wood products, steel, plastic or glass. It's aggregate, a broad term that encompasses a variety of rock products used in construction of roads and buildings. Aggregates are a component of composite materials such as concrete and asphalt concrete; the aggregate serves as reinforcement to add strength to the overall composite material. Aggregates are also used as base material under foundations, roads, and railroads and many other structures. Most aggregate comes from public and privately owned gravel pits and quarries. Whether private or public, aggregate mines are an intensive form of land use that often involves large equipment, heavy truck traffic, and major alterations of the landscape. There are three main forms of aggregate.

1) ***Sand*** is a naturally occurring granular material composed of finely divided rock and mineral particles. Sand particles range in diameter from 0.00246 in. to .079 in. Sand has a number of construction related uses including being an ingredient of Portland cement used to make concrete.

2) ***Gravel,*** is the aggregate of choice for concrete. Its natural roundness makes it easier to mix. In the aggregate industry, the word gravel is defined quite precisely. It refers to

naturally occurring pebbles and stones with rounded surfaces worn by the movement of water or air, and ranging in size from .079 in. to 3 in. in diameter.

3) ***Crushed rock*** is preferred for asphalt pavement, because its multi-faceted surfaces stick together and wear better under traffic. The term crushed rock includes both crushed gravel and crushed stone. Crushed gravel is aggregate taken from a gravel pit and ground or hammered to make the pieces smaller and more uniform in size. Crushed stone is bedrock or talus that has been taken from a quarry and ground or hammered into small fragments. Like gravel crushed rock may be produced in various sizes to suit use.

Concrete crushed at the DARCY is made from a mixture of aggregate, Portland cement, and water. Portland cement is a combination of clay, limestone, and sand that has been heated to high temperatures and then ground into a fine powder. By volume, concrete typically contains about 25 % sand and 41% gravel or crushed rock.

Process to Reclaim/Recycle Aggregate

Most aggregate reclaimed from construction and demolition projects will undergo some type of processing and must be segregated at the source (i.e., project location) before it is taken to the DARCY. The word “processing” covers a variety of activities, including milling, screening, and crushing.

Concrete milling entails removal of concrete pavement surfaces using a milling machine, which can remove up to 50 mm (2 in) thickness in a single pass. Full-depth removal of concrete pavement involves ripping and breaking the pavement using a bulldozer and/or pneumatic concrete pavement breakers. Demolition of concrete structures employs a similar method to break up the concrete using heavy equipment. In most instances, the broken material is picked up and loaded into haul trucks by a front-end loader and transported to the DARCY for processing. At the DARCY, the concrete pavement or structural debris is processed using a series of operations, including crushing, screening, conveying, and stockpiling.

The crushing process includes a vibrating feeder, jaw crusher, impact crusher, vibrating screen, and belt conveyor. Prior to the crushing processing, all protruding reinforcement or rebar is removed or reduced by cutting to a minimum to protect the machinery and personnel. Typically, material is fed to the crusher equipment by a vibrating feeder that evenly and gradually processes the material through a hopper for primary crushing. After first crush, the material is transferred to the impact crusher by belt conveyor for secondary crushing; the crushed materials are then transferred to a vibrating screen for separating. After separating, the aggregate that meets size requirements is transferred for storage as final product, while the remaining larger aggregate is returned to the impact crusher, thus forming a closed circuit. The size of final products can be combined and graded according to project needs and specific requirements.

Diverted Waste Handling Procedures at the Darcy

Upon entering the landfill entrance in route to the DARCY, all vehicles hauling diverted concrete or other approved diverted aggregate waste must proceed to the scale house for weigh-in and inspection by the scale house attendant. The driver will reference at minimum, the Project Name, Project Location, Project Number, Hauler Name and Phone Number, and Project Manager Name and Phone Number to the scale house attendant who will then record the data.

Visual load checks are performed at this point. Loads deemed unacceptable by BOSS Landfill scale house personnel will be directed to the adjacent KSC Class III Landfill for disposal. If loads are found to contain hazardous or other wastes not acceptable for either the DARCY or the landfill, scale house personnel will refuse the load and notify the generator, hauler, Project Manager, and BOSS will notify the NASA Environmental Assurance Branch. The contractor generating the rejected load will be held responsible for any associated costs for disposal, handling and/or cleanup.

If the diverted concrete waste or other material is suitable for recycling and/or reuse, BOSS Landfill personnel will direct the hauler to an area within the DARCY for stockpiling of the material. The hauler will exit from the DARCY stockpile area once all diverted material is properly off-loaded and return to the scale house for weigh-out.

If the vehicle tare weight is on file, the scale house attendant will allow the vehicle to directly exit the landfill entrance. If not, the attendant will acquire the empty vehicle weight. Records of waste concrete deliveries to the DARCY and aggregate product distribution from the DARCY will be retained for at least two years.

Any hazardous waste found in the area where the diverted concrete and aggregate wastes has been stockpiled will be immediately cordoned off from further access to dumping and the generator, hauler, Project Manager, the NASA Environmental Assurance Branch and any other party responsible for shipping the diverted waste to the facility will be immediately contacted to request removal from the landfill. If one of these parties cannot be promptly notified, the landfill scale house personnel will call the contract QSE to initiate the cleanup, transportation, and disposal of the waste by NASA's Post Emergency Spill Response Team. If a suspected hazardous waste is released during the discovery process, the Landfill personnel will immediately evacuate the area and contact KSC 911 (867-7911 for cell phones) spill response.

Concrete with debris and residual soils may be delivered upon occasion. The DARCY has a diverted waste concrete storage area that is located on the south and southwest corners of the site. (See Figure 3) New rock, unscreened rock and screened H1+ /H1- rock (> 1" /< 1" dia.) is stored in the north section of the DARCY facility. The NASA Concrete and Aggregate Processing Contractor utilize the center of the DARCY facility for crushing and classifying operations. All by-product steel rebar is stockpiled and transported by the processing contractor or the contract to the Reuse, Recycling and

Marketing Facility for scrap sale or negotiated as part of the aggregate processing contract.

Residual soil material accumulated at the DARCY from concrete processing operations is stockpiled in the center area of the DARCY site. This soil material may be used by the contract for landfill cover and berm construction. Transfer of the soil by the contract to the KSC Class III Landfill will occur as needed by the Landfill operation or if the amount of soil material has exceeded the allotted storage space at the DARCY. Prior to transferring, soil material will be dampened to avoid dust generation.

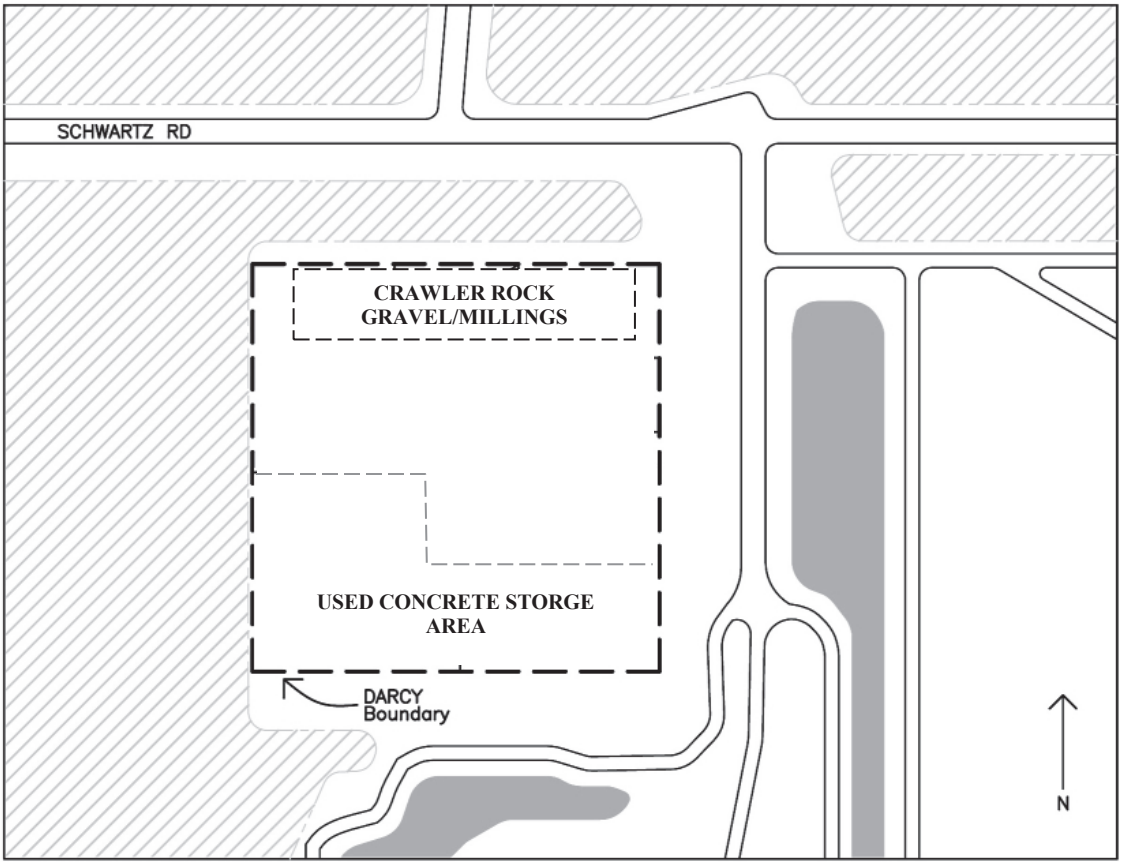

Figure 3, DARCY MATERIAL ACCUMULATION MAP (NTS)

Diverted Waste and Operating Restrictions at the DARCY

Reclaimed waste concrete must be free of contaminants. No oil-stained concrete will be accepted nor will any concrete suspected of having PCBs in applied coatings. Any concrete previously utilized as a transformer pad is restricted from placement at the DARCY site. Any PCB-contaminated waste must be disposed of in accordance with KNPR 8500.1, Environmental Requirements. Painted or coated waste concrete will only be allowed at the DARCY as long as the hauler can provide evidence that the concrete does not contain contamination. Acceptable evidence includes paint or coating analysis results (PCBs and Toxic Characteristic Leaching Potential (TCLP) for RCRA 8 heavy

metals) from a certified laboratory and written verification from the Project Manager. Historical data and/or generator knowledge will be considered by NASA EAB on a case-by-case basis.

No contractor is allowed to conduct any land disturbing activities within the DARCY site without prior written consent of NASA EAB. Land disturbing activities include, but are not limited to, scraping of soil, removal of soil for off-site activities and/or digging. Land disturbance may require that environmental permits be secured prior to conducting these activities and the implementation of erosion and sediment controls. Failure to properly notify the NASA authority will have a negative impact on contract performance review. Any regulatory fines or orders as a result of contractor actions will be the responsibility of the offending contractor.

Records

The contract Landfill Operations personnel will maintain records of quantity by weight of incoming diverted concrete and aggregate wastes and outgoing recycled aggregate product from DARCY operations. Currently, amounts of incoming diverted concrete wastes are reported to NASA EAB and the NASA Facilities Operations and Maintenance Branch along with the Monthly Landfill report.

SURVEILLANCE AND EMERGENCY CONTROL PLAN AT DARCY

NASA EAB will perform monthly surveillance of the DARCY. The Landfill Operator and/or the Scale House attendant will perform load verifications as described previously and will notify the contract QSE and NASA EAB of any anomalous situation at the DARCY. In case of an emergency at the DARCY, all personnel will call 911 (or 867-7911 by cell phone) if the emergency is beyond the capabilities of trained facility personnel to manage or poses an imminent threat to human health or the environment.

Non-emergency spills or releases of pollutant materials, including but not limited to, fuel, oil, coolant, or hydraulic fluids by the Concrete and Aggregate Processing Contractor or the contract personnel during DARCY operations will be reported as a non-emergency spill by the responsible party using the same contact numbers. All releases will be reported to NASA EAB in accordance with KNPR 8500.1, Environmental Requirements. The contract employees will contact the contract QSE to initiate NASA EAB reporting requirements for any contract spills or releases.