



*(Left and above) This is the tunnel boring machine (TBM) that has been designed specifically for the geotechnical conditions under Government Cut. It is as high as a four-story building and longer than a football field.*

The TBM shown above will be used to excavate the twin tunnels. It consists of a **cutter head** with an outside diameter of approximately 43 feet and **trailing support gear** is 419-feet long. The total length of the TBM is 457 feet long. Below is an explanation of how the machine works:

- The cutter head rotates as a cutting wheel boring out the underground area.
- The trailing gear contains the electrical, mechanical and guidance systems and additional support equipment.
- Excavated material is carried back through the trailing gear on a conveyor belt and deposited outside the tunnel entrance, or portal.
- From there it may be moved off-site to be used as fill material or disposed in a manner consistent with applicable rules and regulations.
- As the TBM moves forward it erects precast concrete liners (known as segments) that become the finished wall of the tunnel.
- Once the liners are in place, grout is pumped into the space between it and the excavated area.

### **Arrival**

The tunnel boring machine (TBM) arrived on a cargo ship on Thursday, June 23, 2011, in many parts. There were 21 heavy haul pieces, 75 regular cargo and 20 containers.

### **Delivery**

The TBM parts were offloaded and moved to Watson Island through two different operations. The heaviest pieces were barged from the Port of Miami to Watson Island and delivered to the MacArthur Causeway median via specialized vehicles. The rest of the TBM pieces were trucked in from the Port of Miami to the median.

### **Assembly**

The TBM parts were staged on the center median and were visible from the roadway. Preassembly of several parts began weeks before the cutter-head was lowered into the pit. The cutter-head had to be assembled and welded together before being lowered into the shaft (or launching pit) by an 800-ton crane. This specialized crane was 180 feet tall with an arm length of about 70 feet. The first of six pieces of the TBM shield (bottom part) were lowered into the shaft on August 10. The remaining parts of the shield were lowered one by one daily after that. This was done to facilitate the assembly of the cutter-head and shield in the launching pit.

The TBM has been assembled from front to back (shield first, then gantries) and was completed by the end of October 2011. The TBM was then tested and tunneling began in early November 2011.

