



- **8-ft conveyance tunnel** – As part of the Ship Canal Water Quality Project, there will be two 8-ft conveyance tunnels that will bring stormwater and sewage flows from the Queen Anne and Ballard neighborhoods to the larger storage tunnel for treatment at the Westpoint Treatment Plant. The tunnel boring machines (TBM) that will build these tunnels will be operated remotely by crews above ground. [See our tunnel boring machine comparison chart to learn more!](#)
- **18-ft storage tunnel** – A 2.7-mile long, 18-ft, 10-in interior-diameter tunnel that extends between Ballard and Wallingford. During heavy storms, the tunnel will capture more than 29 million gallons of untreated stormwater and sewage from six different overflow pipes and temporarily store it until the treatment plant is ready to manage it. The eastern end of the tunnel, in Wallingford, will be about 40-ft below the ground. The western end of the tunnel, in Ballard, will be about 100-ft below the ground, allowing the tunnel to drain by gravity towards the pump station in Ballard. [See our tunnel boring machine comparison chart to learn more!](#)
- **Adit** – Short, horizontal tunnel segments that connect vertical shafts to a tunnel.
- **Basin** – An area of land where stormwater collects and drains into a common outlet.
- **Bucket cutters** – A cutterhead tool that is used to keep the edge of the tunnel clean when tunneling takes place.
- **Combined sewer overflow (CSO)** - Sewer pipes in Seattle carry sewage away from homes and buildings to be treated at King County’s treatment plants, before being discharged into the Puget Sound. In some neighborhoods, the same sewer pipes also carry untreated stormwater (rainwater) from roofs, drains, and streets. During heavy rains, if the amount of sewage and stormwater exceeds the system’s capacity, the untreated excess overflows into nearby bodies of water, and can harm fish, wildlife, and swimmers. This is called a combined sewer overflow (CSO).
- **Conveyance pipes or connecting pipes** – Pipes that connect the existing combined sewer system pipes to vertical shafts. In broader terms, these pipes connect the existing sewer network to the storage tunnel.
- **Cutterhead** – The front of the tunnel boring machine (TBM). The cutterhead has a variety of tools to get through the dirt (technically called soil or glacial deposits) that it will encounter as it moves forward underground. Depending on the TBM, these tools can include double-disc cutters, scrapers, bucket cutters and chisels.
- **Diversion structure** – An underground structure that diverts excess untreated sewage and stormwater from the existing pipes to the storage tunnel during heavy rains. Without the



diversion structure in place, the excess untreated flows would get released into a nearby body of water.

- **Double-disc cutters** – A cutterhead tool that is used to dig through hard soil and boulders.
- **Effluent** – Liquid waste or sewage discharged into a body of water.
- **Ground monitoring** - Ground monitoring is a robust system of instruments that help crews measure ground movement. Crews will install monitoring instruments at fixed points on pavement, utilities, and structures so that they can measure movement throughout the project area.
- **Guide walls** – Small walls that outline wall construction to help accurately place slurry walls or secant piles. Guide walls are about 3-ft deep and 2-ft thick.
- **Man-locks (also known as pressure chambers)** - An airlock that allows crew members to go in and out of spaces with differing air pressures. Man-locks will provide access for crew members to the front of the cutterhead during maintenance stops to change out tools.
- **Outfall** – A pipe that discharges sewer and stormwater flows into a body of water during heavy rain events. The Ship Canal Water Quality Project is focused on six outfalls along the Ship Canal. After the storage tunnel is complete, we anticipate an average of no more than one overflow event per outfall per year.
- **Pressure chambers (also known as man-locks)** - An airlock that allows crew members to go in and out of spaces with differing air pressures. Man-locks will provide access for crew members to the front of the cutterhead during maintenance stops to change out tools.
- **Pump station** – A structure that pumps sewage and stormwater from a lower elevation to a higher elevation. For the Ship Canal Water Quality Project, the pump station will be in Ballard. It will pump flows from the storage tunnel to a pipe that will carry them to King County’s Wastewater Treatment Plant in Magnolia.
- **Secant pile wall** – A construction system used to support underground excavations. A secant pile wall is made up of overlapping vertical concrete piles, which together hold back surrounding dirt to allow for excavation and underground construction. Secant pile walls will be used to construct the vertical shafts in Fremont, Queen Anne, and Wallingford.
- **Sewage** – Also known as wastewater, sewage is the “used water” produced from homes and businesses, such as by flushing toilets, washing clothes, or turning on a shower.
- **Scrapers** - A cutterhead tool that is used to loosen materials such as sand and gravel.



- **Screen wall** – A tall plywood wall that surrounds a construction site on several sides. It helps to dampen construction noise, reduce the spread of dust and debris, and keeps the public at a safe distance. Screen walls were installed at the Ballard and Wallingford shaft sites.
- **Slurry wall** – A thick, circular ring of reinforced concrete used to support underground excavation. For the Ship Canal Water Quality Project, slurry walls allow for excavation of interior soils while keeping the excavation from collapsing. Size example: In Ballard, the slurry wall has an inside diameter of 87-ft, is 210-ft deep, and is 4-ft thick.
- **Soil remediation** – A construction technique used to prepare a construction site for excavations. The contractor removes contaminated soil from the construction site, disposes of it safely, and replaces the removed soil with clean soil.
- **Soil stabilization** – A construction technique in which unconsolidated, loose soil is strengthened to prepare for underground construction. During soil stabilization, the contractor may inject different materials into the soil or freeze it to make the consistency better able to handle heavy equipment and excavation.
- **Stormwater** – Any form of water that originates from rain, including snow and ice melt. Stormwater can pick up and carry numerous pollutants into our waterways.
- **Tiebacks** – A horizontal rod or heavy-duty cable used to support retaining walls during construction of underground structures. One end of the tieback is secured to a retaining wall and the other is anchored to the ground horizontally. Often tiebacks extend into the road right of way. Usually, tiebacks are kept in place and disconnected (or de-tensioned) after the permanent wall or building structure is completed.
- **Trailing gear** – Essential equipment that is pulled behind the tunnel boring machine (TBM) while tunneling takes place. Equipment includes the control room (where a machine operator sits to drive the TBM), ventilation equipment, mechanical, electrical, and instrumentation equipment, the conveyor system and muck transport system, a slurry injection system, and other tools.
- **Tunnel boring machine (TBM)** – A machine used to excavate and construct tunnels. The machine digs through soil, breaking it up and removing the tunnel spoils to build a tunnel in its place. Some are operated from a control room within the TBM, others are operated remotely. [See our tunnel boring machine comparison chart to learn more!](#)
- **Tunnel ring** – Each tunnel ring is made up of six segments that fit together to form the wall of the tunnel. After each ring is installed the tunnel boring machine (TBM) will use jacks to push the TBM forward as it excavates the soil and installs the next tunnel ring.



- **Tunnel spoils** – Dirt, soil, or other debris that are excavated during the tunneling process. The storage tunnel spoils will be removed via the vertical shaft in Ballard.
- **Utility relocation** – During construction projects it may be necessary to relocate or adjust existing utilities to accommodate construction activities. This may include street lighting, traffic signal facilities, water, sewer, and drainage mains.
- **Vent shaft** – A vertical shaft to allow air release from the storage tunnel while it is filled with water. The vent shaft is connected to a facility that removes odor from the vented air.
- **Vertical shaft** – Large, underground structures holding vertical drop pipes that carry sewage and stormwater from the combined sewer system into the storage tunnel. Vertical shafts also provide maintenance access to the storage tunnel. Size example: In Ballard, the vertical shaft will be approximately 100-ft deep and 90-ft wide.
- **Vertical concrete piles** - Piles made of concrete that are cast into place inside a hole bored into the ground. These piles are used as foundation for the secant pile wall. Some piles are reinforced.