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SR 99 Tunnel and Bertha

A Case Study in Design-Build Risk Allocation

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Project at a Glance

- **Project:** State Route 99 Bored Tunnel (Alaskan Way Viaduct Replacement Program), a 1.7-mile, four-lane, double-deck highway tunnel beneath downtown Seattle replacing the seismically vulnerable Alaskan Way Viaduct
- **Owner:** Washington State Department of Transportation (WSDOT)
- **Contractor:** Seattle Tunnel Partners (STP), a joint venture led by Dragados USA (subsidiary of Spanish tunneling firm ACS/Dragados) and Tutor Perini Corporation of California (45 percent shareholder)
- **TBM manufacturer:** Hitachi Zosen Corporation (Osaka, Japan)
- **Delivery method:** Design-build with a Differing Site Conditions (DSC) clause
- **TBM:** "Bertha," a 57.5-foot diameter Earth Pressure Balance Machine (EPBM), the world's largest TBM at the time of construction
- **Tunnel contract value:** approximately $1.44 billion
- **Total program value (with ramps, viaduct demolition, surface street, related work):** approximately $3.3 billion
- **Construction contract signed:** January 2011
- **Tunneling start:** July 2013
- **TBM stoppage:** December 6, 2013, after approximately 1,000 feet (about 11 percent of the dig)
- **TBM rescue and repair period:** December 2013 to December 2015 (approximately two years)
- **Tunneling resumption:** January 2016
- **Tunnel breakthrough:** April 2017
- **Tunnel opening to traffic:** February 4, 2019
- **Schedule slip:** approximately 867 days (about 2.5 years late) against the original contract completion
- **Litigation outcome (December 2019 verdict):** Jury found in favor of WSDOT, awarded $57.2 million in damages to the state and rejected STP's $300 million claim
- **Appeals:** 2022 Court of Appeals upheld the verdict; Washington Supreme Court ultimately upheld a final award of approximately $77 million including interest and additional costs

Why This Case Matters

Few construction projects in modern U.S. history have been studied as closely as the SR 99 Tunnel. The combination of factors makes it almost uniquely instructive: the world's largest TBM at the time, a design-build contract with explicit risk allocation between owner and contractor, a Differing Site Conditions clause that became central to the dispute, a Dispute Review Board recommendation that went one way, a jury verdict that went the other, and an appellate process that ran for years after the tunnel opened.

For schedulers, the project illustrates the schedule risk that can never be fully eliminated from heavy underground work: the TBM that breaks down. For contract administrators, it is a case study in how the language of a DSC clause and the geotechnical baseline reports can determine the outcome of hundreds of millions of dollars in claims. For forensic schedule analysts, the two-year work stoppage and its cascading effects on the entire program produce exactly the kind of fact pattern that Windows Analysis, the Half-Step, and concurrency doctrine are designed to address. For owner and contractor leadership, the project is a study in how risk allocation set in a contract drafted years before construction begins ultimately determines who pays when something goes wrong.

The tunnel itself works. It opened in February 2019, and as of recent reporting carries up to 80,000 vehicles per day including heavy freight traffic. The Alaskan Way Viaduct came down. The Seattle waterfront is being remade. The project achieved its underlying public purpose. But it took about two and a half years longer than originally scheduled, and the litigation over who bears the cost of that delay shaped a generation of design-build risk allocation thinking in the U.S. tunneling industry.

Background and Project Structure

The Alaskan Way Viaduct, an elevated double-deck section of State Route 99 along Seattle's waterfront, was built in the 1950s. The 2001 Nisqually earthquake exposed its seismic vulnerability. WSDOT's risk assessments indicated a roughly 1-in-20 chance that the structure could be shut down by an earthquake within the next decade. Replacement became a public safety priority.

After extensive public debate over alternatives (a replacement viaduct, a surface boulevard, or a tunnel), the State elected the bored tunnel option. The contract was awarded in 2011 to Seattle Tunnel Partners, a joint venture led by Dragados USA and Tutor Perini, on a design-build basis. STP, in turn, contracted with Hitachi Zosen of Osaka, Japan, to design and supply the TBM.

The contract structure was central to everything that followed. WSDOT explicitly designed a contract structure that placed tunneling risk on the contractor. WSDOT Secretary Roger Millar publicly characterized the contract structure as one that "placed the risks of tunneling on the contractor." This is not unusual on design-build tunneling projects, where contractor expertise in TBM operation is the primary value proposition. What made the SR 99 contract notable was the eventual judicial test of whether and how the DSC clause limited that risk allocation.

The TBM itself was extraordinary. Bertha was 57.5 feet (17.4 meters) in diameter, the largest EPBM ever built at the time. It was 326 feet long, weighed approximately 7,000 tons, and its rotating cutterhead alone weighed 4 million pounds. The machine was custom-designed for the SR 99 project's specific subsurface conditions: glacial till, sands, clays, and isolated boulders, all under a shallow cover beneath downtown Seattle and the Alaskan Way Viaduct.

Tunneling commenced in July 2013. By early December 2013, Bertha had advanced approximately 1,000 feet, about 11 percent of the planned 9,270-foot drive.

What Actually Went Wrong

The Stoppage

On December 3, 2013, Bertha encountered an eight-inch diameter, 119-foot-long steel pipe in its path. The pipe was a groundwater monitoring well casing installed by WSDOT in 2002 as part of geotechnical investigations for the project. STP project personnel had assumed the pipe had been removed before tunneling began. It had not.

Three days after encountering the pipe, on December 6, 2013, Bertha overheated and stalled. The exact causal chain became central to the subsequent litigation, but the basic facts were not in dispute: the TBM was running, then it was not, and the cutterhead and main bearing required substantial repair before tunneling could resume.

STP's position was that steel from the shredded pipe got stuck in Bertha's rotary cutting head and teeth, setting off a chain reaction of problems that ruined internal bearings and gears.

WSDOT's position was that other factors led the machine to overheat and that seals protecting the main bearing became contaminated, that the TBM had been inadequately designed and operated, and that a steel groundwater monitoring well casing was, in WSDOT attorney David Goodnight's words during the trial, "nothing more than a toothpick" to a 57-foot cutting head.

The truth probably involves elements of both narratives. TBMs of unprecedented scale carry their own design and operational risks. Eight-inch steel pipe casings being run over by 4-million-pound cutterheads also produce damage. The legal question was which factor was the primary cause, and whether the pipe was disclosed adequately enough in the contract documents that STP should have anticipated it.

The Recovery

The TBM repair was a major construction project in its own right. STP, with engineering and parts support from Hitachi Zosen, designed and constructed an 83-foot-deep emergency recovery shaft just south of the Alaskan Way Viaduct, lifted the 4-million-pound front end of the machine to the surface, replaced the cracked main gear, broken bearing seals, and other damaged components, and lowered the rebuilt machine back into the ground for restart.

The recovery shaft itself was a serious engineering effort. Excavating an 83-foot-deep, 80-foot-diameter shaft adjacent to the operational Alaskan Way Viaduct (which was already seismically vulnerable and had its own settlement concerns) required extensive ground stabilization, monitoring, and specialized equipment. The work took approximately two years from the initial stoppage in December 2013 to the resumption of tunneling in January 2016.

During the recovery period, sensors did detect some surface settlement above the shaft, and concerns were raised about whether the work was affecting the Viaduct above. These concerns were investigated and ultimately the project proceeded, but they added political and technical pressure to a recovery effort that was already extraordinarily complex.

The Resumption

Once the repaired TBM was relaunched in January 2016, the remaining drive proceeded without further serious incident. Bertha completed the remaining approximately 8,000 feet of the dig, achieved breakthrough at the north portal in April 2017, and the four-lane tunnel opened to traffic on February 4, 2019.

This is an important detail in the case. The post-repair performance of the TBM was, by all accounts, broadly acceptable. The machine made its way the rest of the way to South Lake Union, completing the remaining drive without further incident. This factual point became part of the contractor's argument: if the TBM was fundamentally well-designed, why did it work fine for 8,000 feet after repair?

The counter-argument is that the post-repair Bertha was a substantially rebuilt machine, with new components installed by the manufacturer working alongside STP crews, and that the question is not whether the rebuilt machine worked but whether the original machine was adequate to its task.

The Dispute and Its Resolution

The Differing Site Conditions Claim

The legal heart of the dispute was the Differing Site Conditions (DSC) clause in the design-build contract. A standard DSC clause provides that if the contractor encounters subsurface conditions materially different from those indicated in the contract documents, the contractor is entitled to an equitable adjustment of price and time. The clause is meant to allocate the risk of unforeseen conditions to the owner (who controls the contract documents and the geotechnical baseline) rather than to the contractor (who has limited ability to investigate the subsurface independently before bidding).

STP's claim was that the steel well casing was a differing site condition: it was not adequately disclosed in the geotechnical baseline reports that governed the bid contract, and it caused the TBM failure that led to the two-year delay. Therefore, STP argued, it was entitled to recover the cost of TBM repair and the cost of extended duration on the project.

The Dispute Review Board Recommendation

In May 2015, the project's three-person Dispute Review Board (DRB) issued a non-binding recommendation in favor of STP on the DSC question: the DRB found that the eight-inch steel well casing within the work zone was not adequately identified in the contract, thus recognizing it as a differing site condition.

DRB recommendations are not legally binding, but they are admissible in court and historically have been given significant weight. WSDOT had typically accepted DRB recommendations on prior projects. On this one, WSDOT did not.

The Litigation

WSDOT sued STP in 2016, claiming $57.2 million in liquidated damages and other costs related to STP finishing the project 867 days late. STP counterclaimed, eventually seeking up to $642 million in preliminary court filings, reduced to $300 million as a cap by the trial judge.

The case went to trial in October 2019 in Thurston County Superior Court before Judge Carol Murphy. Two-month jury trial. Multiple expert witnesses on both sides. Closing arguments on December 12, 2019. The jury returned its verdict on December 13, 2019.

The jury found:

- WSDOT had provided sufficient notice of the underground conditions, including the existence of the steel pipe.
- STP was responsible for the TBM breakdown, not WSDOT.
- WSDOT was awarded the full $57.2 million it had sought in damages.
- STP's $300 million counterclaim was denied in full.

Why STP Lost

Multiple factors likely contributed to the outcome, but a few stand out from the public record.

The pipe was disclosed, even if imperfectly. STP project staff had examined the pipe location at least twice before tunneling began, according to records uncovered during the case. While STP argued that the disclosure was insufficient under the contract's specific terms, the jury appears to have found that the actual notice was adequate.

Spoliation of evidence. Judge Murphy found that STP and its partners had committed spoliation of evidence, with workers having lost or destroyed pipe fragments during the

2013-14 winter that had been left on a pallet at the job site. A deputy director's journal for that period also went missing. The judge issued "adverse instructions" to the jury, limiting how STP could portray its evidence about the pipe. Spoliation is a serious finding in any litigation. Combined with the other elements of the case, it materially weakened STP's position.

Hitachi Zosen settled separately. The TBM manufacturer reached an undisclosed settlement with STP before trial, ending its participation as a co-defendant in the original action. This left STP as the sole party arguing the pipe-caused-it theory at trial, with the manufacturer notably absent from the courtroom and any public defense of its machine's design.

The "toothpick" framing. WSDOT's trial attorney, David Goodnight, succeeded in framing the steel pipe as too small a thing to have caused a TBM the size of Bertha to fail. This framing, combined with the inherent intuition of jurors viewing a 57-foot cutterhead photograph, was rhetorically powerful. Whatever the underlying engineering reality, "an 8-inch pipe versus a 57-foot machine" is a hard narrative for the contractor to overcome with a non-technical jury.

The Appeals

STP appealed. In 2022, the Washington State Court of Appeals upheld the trial court verdict in a 30-page ruling, finding that the trial judge had given proper jury instructions and that the contract documents had adequately disclosed the underground conditions. The Washington Supreme Court ultimately affirmed, with the final award growing to approximately $77 million with interest.

A separate WSDOT action against STP's insurance carriers, seeking up to $44 million for repair and reinstatement of the TBM, continued after the main case.

The Broader Risk Allocation Lessons

Design-Build Tunneling Carries Real Contractor Risk

The SR 99 outcome is consistent with what major-project tunneling experience would predict: when an owner explicitly structures a design-build contract to place tunneling risk on the contractor, and the contractor encounters problems on a TBM it designed and

operated, the contractor typically bears the cost. The DSC clause is a real protection, but it requires the contractor to prove that the disclosed information was inadequate AND that the inadequately disclosed condition was the cause of the loss. Failing on either prong defeats the claim.

DRB Recommendations Are Not Verdicts

The DRB recommendation in May 2015 was a meaningful procedural moment but not a determinative one. WSDOT exercised its right to reject the recommendation and proceed to litigation. The eventual jury and appellate decisions went the other way. For owners, this is a reminder that DRB recommendations against the owner's position do not automatically dictate settlement. For contractors, it is a reminder that a favorable DRB recommendation is encouraging but not a substitute for trial preparation.

Geotechnical Baseline Reports Matter Enormously

The case turned in significant part on what was in the geotechnical baseline reports and what should have been but was not. Owners and their consultants drafting GBRs for design-build tunneling contracts should treat the document as a primary risk allocation instrument. Every existing subsurface obstruction, every prior investigation artifact, every old foundation, utility, monitoring well, and abandoned pile should be specifically identified and characterized. Contractors bidding tunneling work on the basis of GBRs should treat the GBR as the primary basis for their risk pricing and document any gaps or ambiguities in writing before bid.

Evidence Preservation Discipline From Day One

The spoliation finding against STP for losing or destroying pipe fragments and a key journal during the 2013-14 winter materially weakened the contractor's case. On any major project where claims are foreseeable, evidence preservation has to start the day a problem emerges. Physical samples, photographs, daily reports, communications, internal memoranda, and computational models all become exhibits if litigation follows. A formal evidence preservation hold should be implemented as soon as a project event suggests potential dispute.

TBM Selection and Manufacturer Engagement

The Hitachi Zosen settlement before trial removed the manufacturer's voice from the courtroom. The implications of this for STP's defense are speculative, but it left the contractor arguing alone that an unprecedented machine performed adequately when challenged. For future major TBM projects, the contractual relationship between contractor and TBM manufacturer, including the manufacturer's obligations during dispute support, deserves explicit attention. A TBM manufacturer who exits the dispute through settlement leaves the operating contractor exposed.

The Cost of a Public Trial on a Public Project

The two-month jury trial, the multi-year appellate process, and the public coverage of every procedural step combined to make this dispute one of the most visible construction cases in the U.S. of the past decade. Public trial of a public project produces public scrutiny of both parties' decisions, internal communications, and project execution practices. Both owners and contractors should weigh this when evaluating whether to settle or litigate. In this case, WSDOT's willingness to take the case to trial, combined with sustained executive support from the Governor's office, was an important factor in the eventual outcome. Not every owner has that institutional patience.

Schedule Lessons for TBM and Heavy Civil Work

TBM Risk Is Catastrophic Tail Risk

A properly functioning TBM advances at a remarkably predictable rate. A non-functioning TBM advances at zero. The transition between those two states can occur in minutes, with consequences measured in years. Schedules for TBM-driven projects should include explicit contingency for catastrophic TBM events: cutterhead intervention, main bearing replacement, ground intrusion, collapse, and similar high-impact, low-probability scenarios. The base schedule should reflect expected performance; the contingency should reflect tail risk.

TBM Recovery Is Its Own Project

The recovery shaft excavation, machine extraction, repair, reassembly, and reinstall took approximately two years on Bertha. That is not unusual for major TBM recoveries. Owners

and contractors should be aware that a TBM recovery, if required, is a multi-month to multi-year construction project nested inside the original contract. The recovery work has its own permitting, its own technical risks, its own cost, and its own schedule, and none of it was in the original baseline.

Dewatering, Settlement, and Adjacent Structures

The Bertha recovery shaft was constructed adjacent to the Alaskan Way Viaduct, which had its own seismic vulnerability and settlement sensitivity. The recovery work required ground stabilization, settlement monitoring, and ongoing assessment of impacts on the Viaduct. Like the Elliott Bay Seawall, this is a reminder that TBM and major underground work in dense urban environments is constrained as much by what is adjacent to the work as by the work itself.

Schedule Float and Two-Year Stoppages

Standard CPM schedule float quantities, even on major projects, do not absorb a two-year work stoppage. When tunneling stops for two years, the entire downstream sequence (tunnel finishes, MEP, ventilation systems, life safety integration, surface restoration, ramp construction, viaduct demolition, surface street redevelopment) shifts. This is not an exception case for which the project schedule needs better float, it is a fundamental reset of the schedule. Forensic schedule analysis of these events typically requires re-baselining, careful application of MIP 3.5 (Modified or Recreated) variants, and explicit treatment of how downstream activities were re-planned during and after the recovery.

Concurrent Delay and TBM Disputes

The SR 99 case did not turn primarily on concurrent delay analysis, but on the DSC clause and causation. Other TBM disputes, however, frequently involve overlapping owner-caused, contractor-caused, and force majeure delays during recovery. Forensic schedule analysts working on TBM disputes should be prepared to apply rigorous concurrency analysis: which delays were on the critical path during which windows, who caused them, and how the parties' actions interacted during recovery.

What the Project Got Right

The SR 99 Tunnel succeeded in its core mission. The seismically vulnerable Alaskan Way Viaduct was replaced. The waterfront was reconnected to the city. The tunnel carries up to 80,000 vehicles per day including heavy freight. No major safety incident occurred during construction or operation. The recovery from the December 2013 stoppage, while extraordinarily complex, was successfully executed without damage to the adjacent operating Viaduct or to upland structures.

WSDOT's contract structure, in retrospect, did exactly what it was designed to do. Tunneling risk was placed on the contractor. The contractor encountered tunneling problems. The contractor paid for them. Whatever criticisms can be made about specific elements of the project, the underlying risk allocation strategy held.

STP's recovery effort, working with Hitachi Zosen, was an extraordinary engineering accomplishment. Designing, permitting, and constructing an 83-foot-deep recovery shaft beneath downtown Seattle adjacent to a vulnerable elevated viaduct, while lifting and rebuilding the world's largest TBM, is genuinely difficult work. The fact that it was completed and the tunnel was eventually delivered is a testament to the technical capability of the contractor team, even as the legal outcome went against them.

Closing Observation

The SR 99 Tunnel and Bertha story is, ultimately, a story about contract structure determining outcome. WSDOT structured a design-build contract to allocate tunneling risk to the contractor. The contractor accepted that risk and bid accordingly. When the risk materialized in the form of a stalled TBM and a two-year recovery, the contract did what it was structured to do. The DSC clause provided a path for the contractor to seek relief, but only on conditions (adequacy of disclosure, causation by the undisclosed condition) that the eventual finder of fact concluded were not met.

For owners, the case is a reminder that contract risk allocation written years before construction begins is worth defending in court if the contract structure is sound. WSDOT's institutional patience to pursue the case through trial, appeal, and Supreme Court review is what produced the final outcome. Owners without that patience will not get those results, regardless of the contract.

For contractors, the case is a reminder that design-build tunneling on a project of this scale carries real residual risk that cannot be fully hedged contractually. STP's approximately $300 million claim was reduced to zero, and STP was instead ordered to pay $57.2 million plus interest. That outcome was not guaranteed, but it was also not surprising given the contract structure, the trial record, and the specific procedural failures (notably spoliation) that accumulated against the contractor's position.

For schedulers, the case is a reminder that TBM risk is the single largest schedule risk on most major tunneling projects, that recovery from a major TBM event is its own multi-year project, and that the forensic schedule analysis required to support claims arising from such events requires careful application of AACE methodology to a fact pattern that does not fit the standard project lifecycle. The Half-Step, Windows Analysis, MIP 3.5 reconstruction, and concurrency doctrine are all directly relevant. Generic schedule analysis is not.

The tunnel opened in February 2019. The Viaduct came down. The waterfront is being remade. The project's underlying public purpose was achieved, and that achievement is real. But it was achieved on a schedule and at a cost that will be studied in U.S. underground construction practice for decades, and the lessons it produced are now part of the foundation on which future major tunneling contracts will be drafted, defended, and litigated.

References

- Washington State Department of Transportation, *SR 99 Tunnel Project* documentation and public reporting.
- Thurston County Superior Court, WSDOT v. Seattle Tunnel Partners (Judge Carol Murphy presiding), trial October to December 2019.
- Washington State Court of Appeals, Division II, 2022 ruling upholding trial court verdict.
- *The Seattle Times* coverage of the SR 99 Tunnel project, including reporting on the December 2013 stoppage, the recovery operation, and the 2019 trial verdict.
- *MyNorthwest.com*, *KOMO News*, *KIRO 7 News*, and *King 5 News* contemporaneous coverage of project milestones, the lawsuit, and the verdict.

- *TunnelTalk* technical reporting on the Bertha TBM, the recovery operation, and the dispute.
- *ACS Lawyers* analysis of the Differing Site Conditions claim and Dispute Review Board process.
- *Tunneling Online* trade press coverage of the verdict and broader industry implications.
- AACE International, *Recommended Practice No. 29R-03, Forensic Schedule Analysis*, particularly relevant for the application of MIP 3.5 (Modified or Recreated) to events involving major work stoppages.

Note: The SR 99 Tunnel case generated extensive public documentation including court filings, expert reports, and contemporaneous media coverage. Practitioners citing this case in formal work should consult the primary court records and WSDOT documentation for specific findings of fact. This article is for informational purposes only and is not intended to provide professional advice.