



U.S. DEPARTMENT OF
ENERGY

OFFICE OF
**ENVIRONMENTAL
MANAGEMENT**

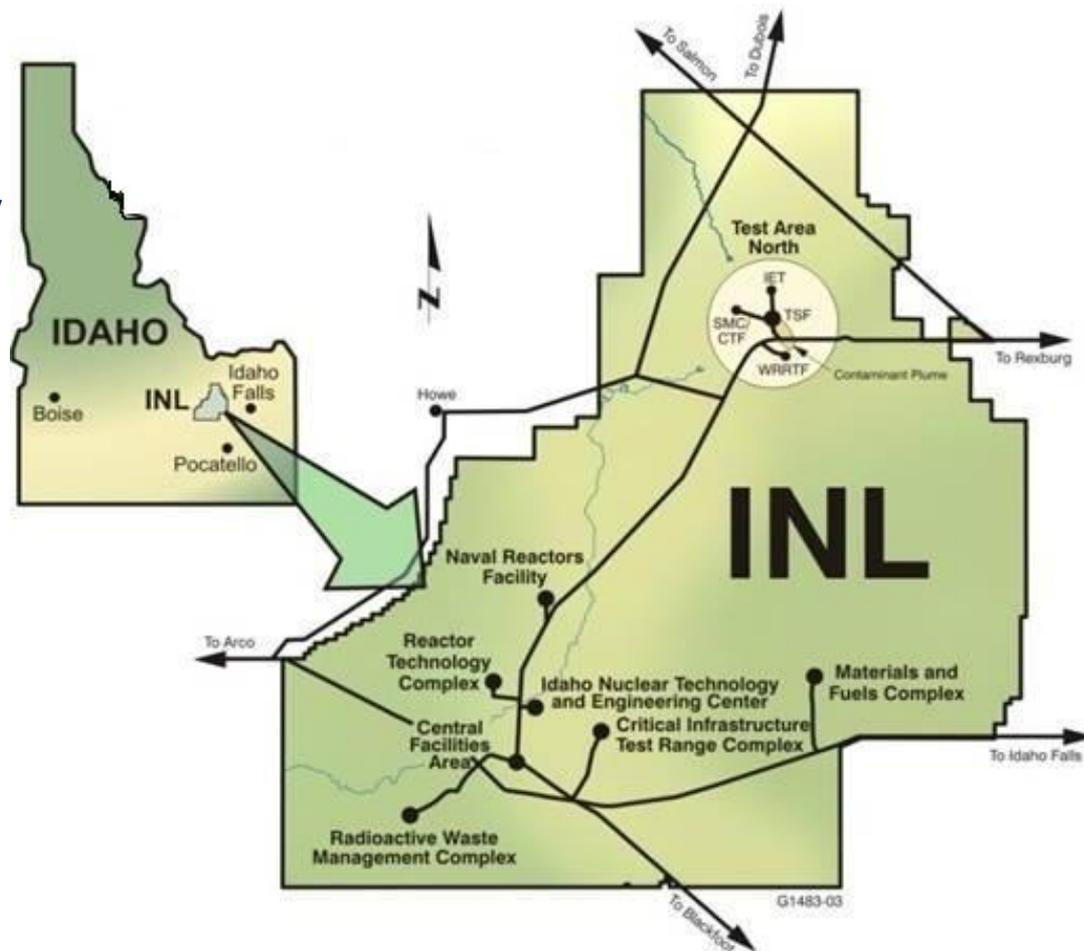
Idaho Cleanup Project Test Area North Groundwater Remediation History and Progress to Date Citizens Advisory Board

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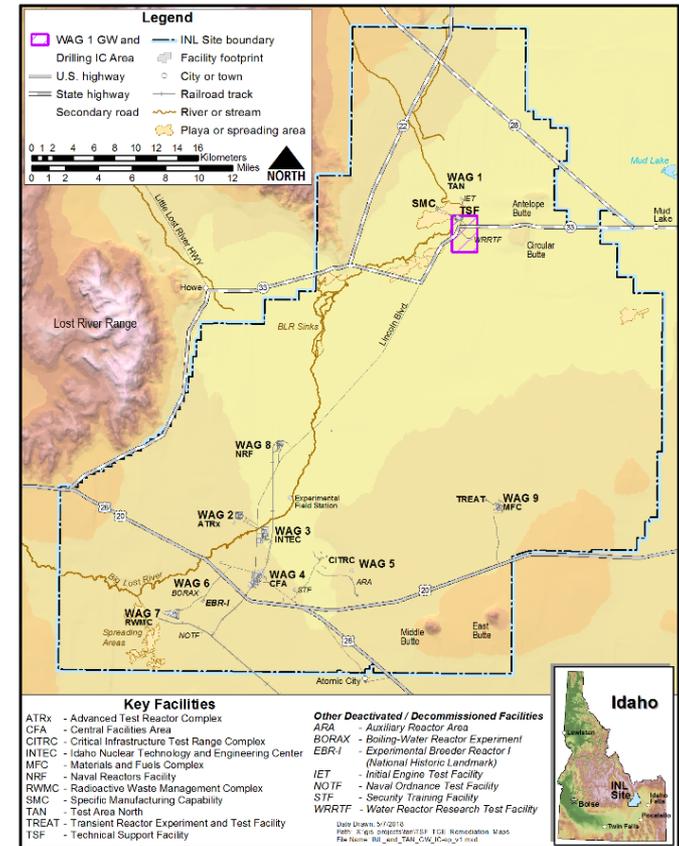
Overview

- TAN Location and Mission
- Source and Extent of Contamination
- Contaminants of Concern
- Remedy Components
- Recent Changes in Strategy
- Status of Remediation



TAN Location and Mission

- TAN is located in the northern portion of the INL Site.
- Built in early 1950's.
- Mission was to support the Aircraft Nuclear Propulsion Program.



Contaminant History

- Wastes generated at TAN included sanitary sewage, process waste waters and low-level radioactive liquid wastes From the Aircraft Nuclear Propulsion program.
 - Hazardous waste included corrosive and ignitable wastes from shop operations and corrosive and toxic condensate from a waste disposal system evaporator.
 - Suspected metals included mercury, chromium, and lead associated with various program operations, shielding, decontamination activities, etc.
 - Little definitive information is available regarding the processes that generated organic wastes.
- Liquid wastes were disposed of into the TSF-05 injection well.

TSF-05 Injection Well

- TSF-05 injection well was drilled to 305 ft. below land surface.
- Used from 1953 to 1972 to dispose of TAN's liquid waste.
- Estimates of Trichloroethene (TCE) disposed of into TSF-05 range from 350 to 35,000 gallons.
- TCE was discovered in TAN drinking water in 1987.
- TSF-05 identified as the source.

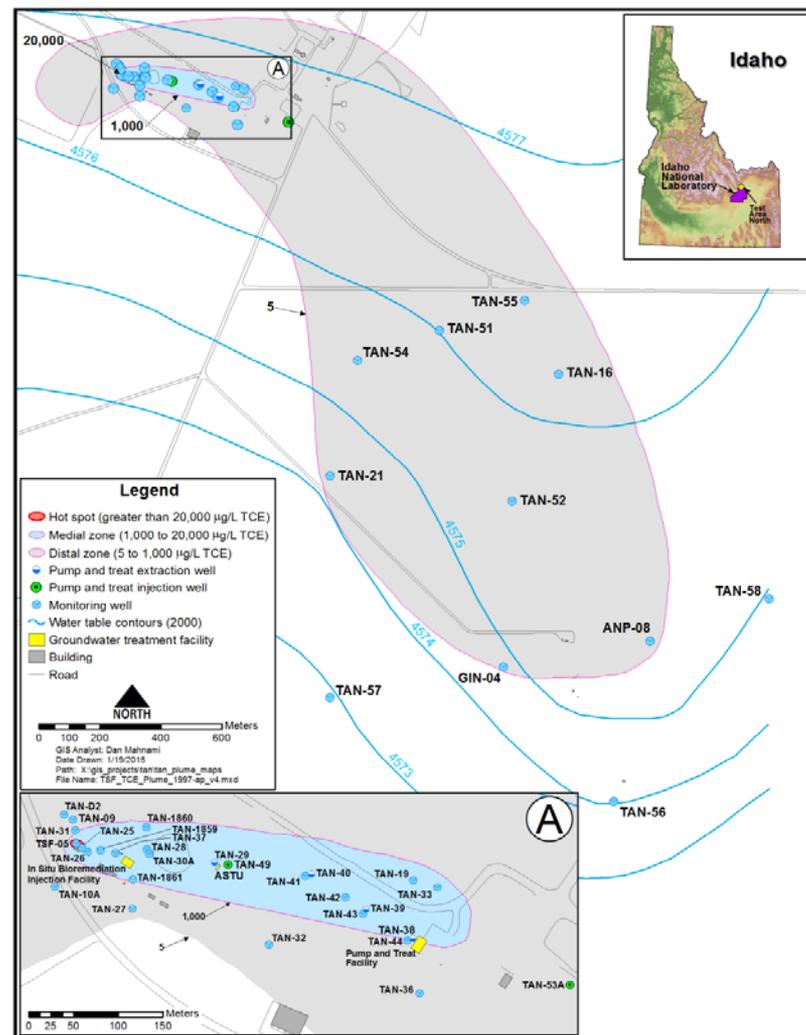


Removal of sludge from the bottom of the TSF-05 injection well during 1990.

Nature and Extent of Contamination

- Contaminants of Concern (COCs) include VOCs and radionuclides.
- Primary COC is TCE.
- TCE plume is nearly 2 miles long.
- Contaminated aquifer is 200-400 ft. deep.

Contaminant of Concern	Maximum Historical Concentrations	Federal Drinking Water Standard /MCL
Volatile Organic Compounds	(µg/L)	(µg/L)
TCE	12,000–32,000	5
PCE	110	5
cis-1,2-DCE	3,200–7,500	70
trans-1,2-DCE	1,300–3,900	100
Radionuclides	(pCi/L)	(pCi/L)
Tritium	14,900–15,300	20,000
Sr-90	530–1,880	8
Cs-137	1,600–2,150	200
U-234	5.2–7.7	27



Map of the TAN groundwater plume at the time of the Record of Decision amendment during 2001

In-Situ Bioremediation of Hot Spot

- In Situ Bioremediation (ISB) is the selected remedy for the Hot Spot.
- Inject food source (whey, lactate amendment) into Hot Spot wells to create conditions favorable for naturally occurring anaerobic microbes to degrade VOCs in the aquifer.
- ISB injections conducted for 13 years.
- Transitioned to rebound test in July 2012.
- Rebound test split into two parts in 2016:
 - Partial area rebound test, and
 - TAN-28 TCE source action



250-Gallon totes contain liquid amendment currently used for in-situ bioremediation of the Hot Spot



Amendment being inserted into to a well

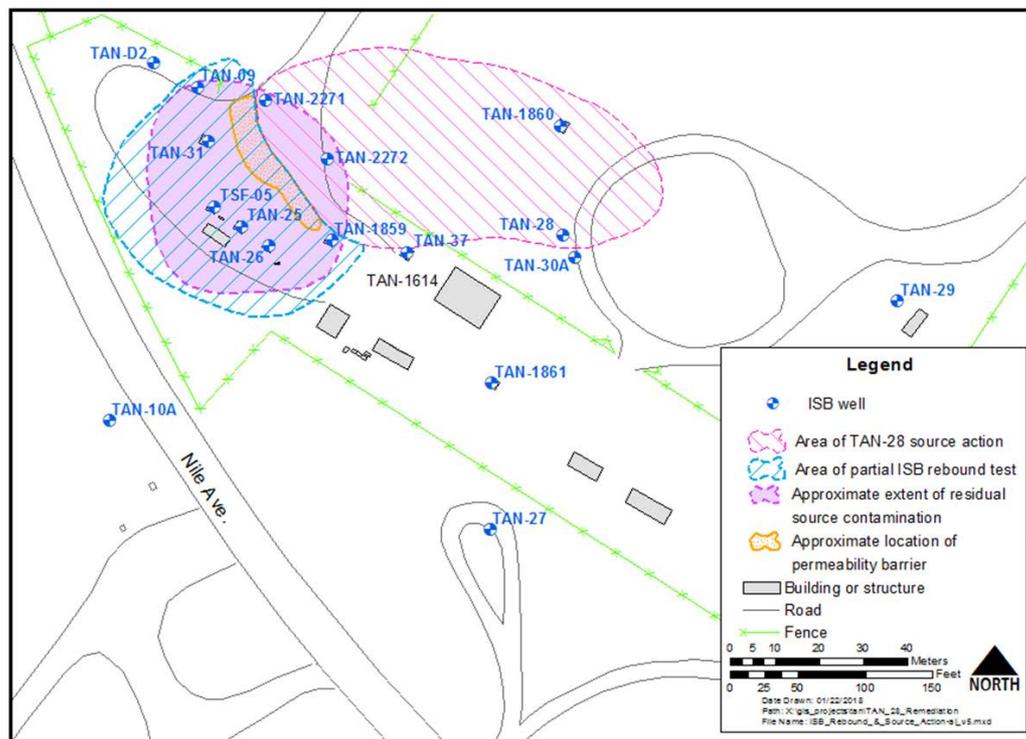


Whey powder formerly used as amendment was prepared for insertion with this device

Current ISB Status

- Partial ISB Rebound Test
 - Stopped injecting ISB amendment into Hot Spot wells to allow conditions to return to background.
 - Began Rebound Test 2012.

- TAN-28 TCE Source Action
 - Resume limited ISB injections into targeted wells in an attempt to reach a residual source affecting TAN-28:
 - TAN-2272 in 2016
 - TAN-37 in 2018



Blue dashed line = partial rebound test
 Pink dashed line = focused source action around well TAN-28
 Pink dashed line with pink shading = approximate extent of residual contamination

New Pump and Treat Facility (NPTF)

- Pump and Treat is the selected remedy for the Medial Zone.
- NPTF utilizes air stripper treatment units designed to treat VOCs.
- New Pump and Treat Facility (NPTF) started in 2001.
- Objective is to reduce the flux of VOCs (TCE) into the distal zone by extracting from three up-gradient wells and discharging treated water downstream.



Pump and Treat facility



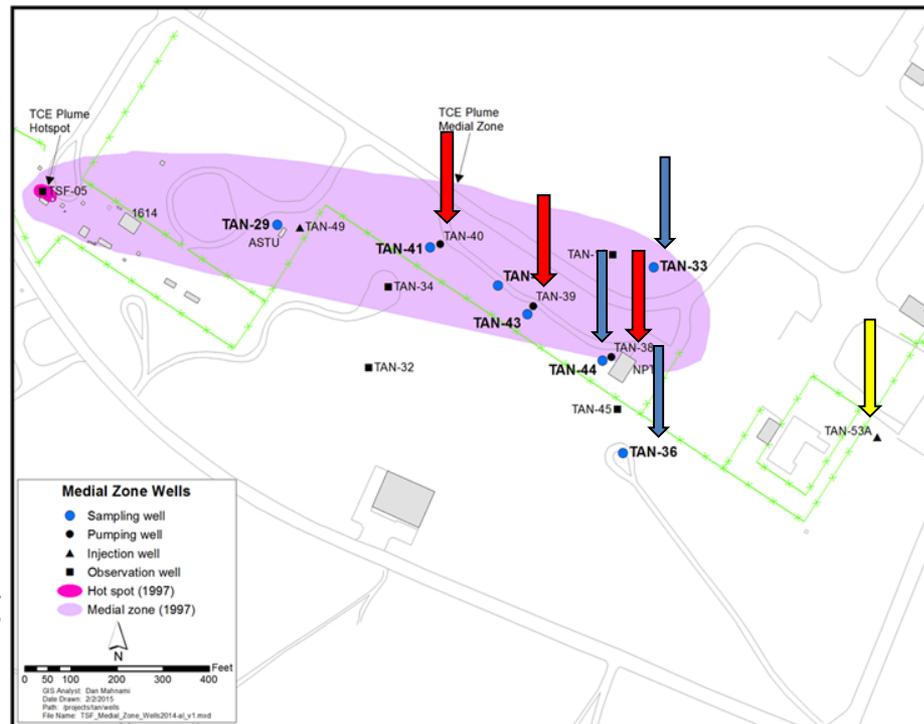
Pump and treat facility surge tank



Aerial photograph of Technical Support Facility (TSF) portion of Test Area north (TAN)

NPTF Operating Strategy and Status

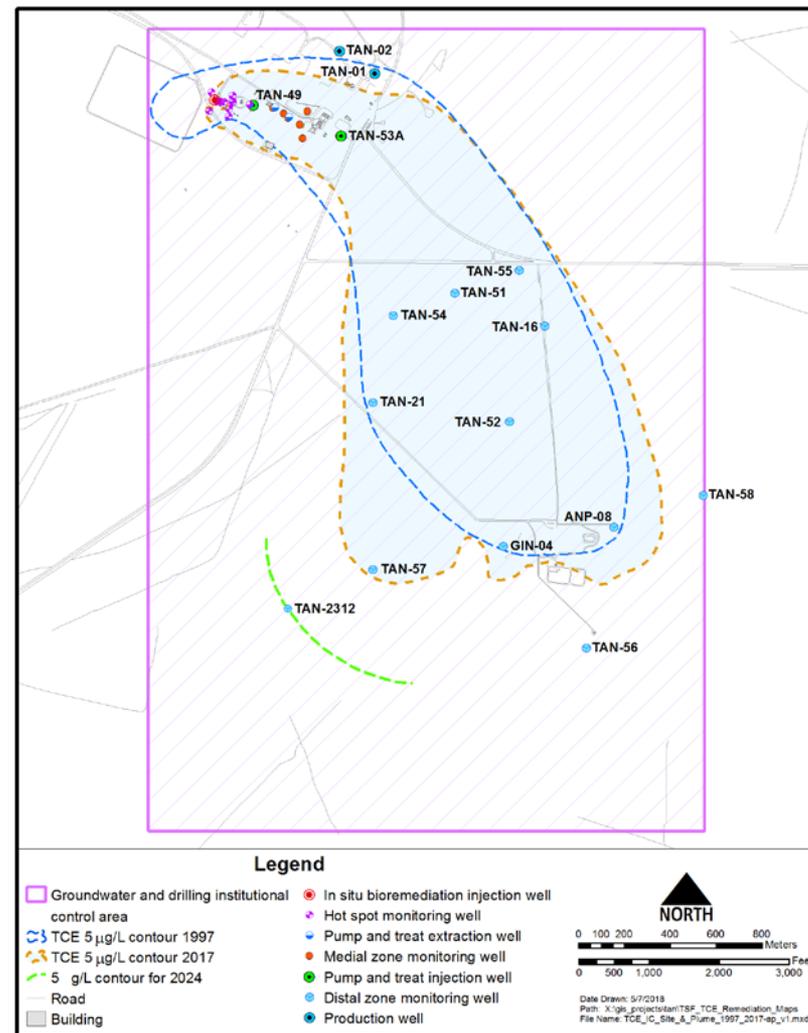
- Groundwater is extracted from wells TAN-38, TAN-39 and TAN-40 (indicated by red arrows).
- After water is treated to meet TCE MCL, it is re-injected into TAN-53-A (yellow arrow)
- TCE concentrations are monitored at TAN-33, TAN-36 and TAN-44 to ensure that the flux of TCE migrating through the medial zone into the distal zone does not exceed 200 µg/L (blue arrows).
- Currently TCE concentrations are well below 100 µg/L.
- NPTF is operated voluntarily 4 days per week:
 - Reduces TCE concentrations migrating downgradient
 - Reduces time to achieve RAOs
- Over 700 million gallons of water treated to date.



Medial zone wells associated with pump and treat portion of remedy
 Red arrows = extraction wells
 Blue arrows = monitor wells
 Yellow arrow = down gradient well where water is injected post-treatment

Monitored Natural Attenuation (MNA)

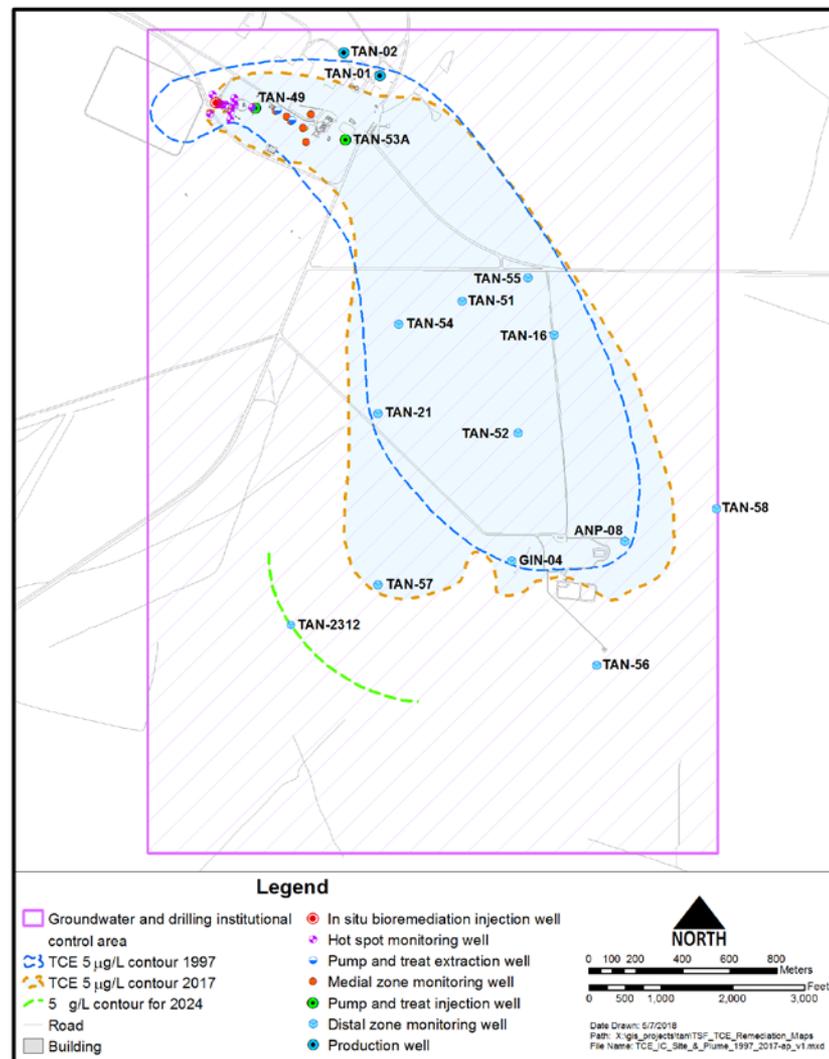
- MNA is the selected remedy for the Distal Zone.
- MNA is defined as the sum of physical, chemical, and biological processes that act without human intervention to reduce mass, toxicity, volume, or concentration of contaminants in groundwater.
- TCE concentrations must be declining at a rate that will be at or below MCLs by 2095.
- Plume expansion not to exceed 30 percent.



Current plume map (yellow dashed line) in comparison to plume at the time of CERCLA ROD (blue dashed line)

MNA Status (continued)

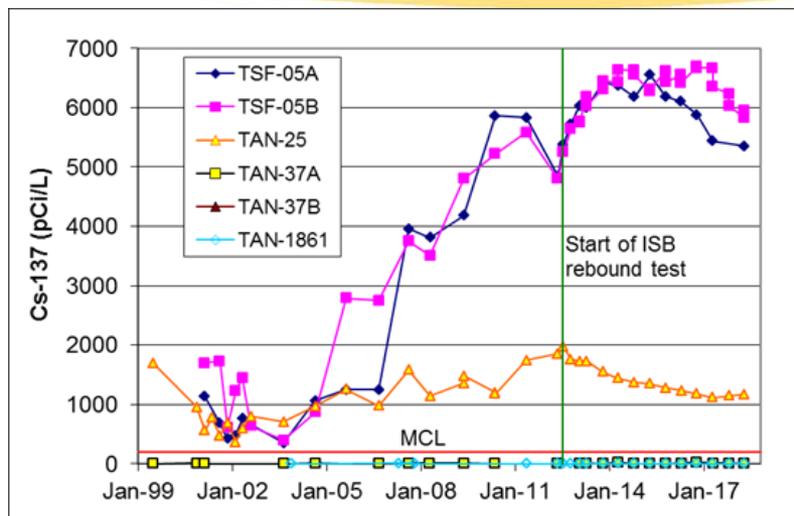
- TCE concentrations in the MNA wells are trending in a manner that indicates they are on track to meet the RAOs.
- Remedy is only 20 % into remedial timeframe.
- Continue monitoring to ensure RAOs will be met by 2095.
- Plume has expanded within the IC area as anticipated by the ROD, but has not exceeded 30%.



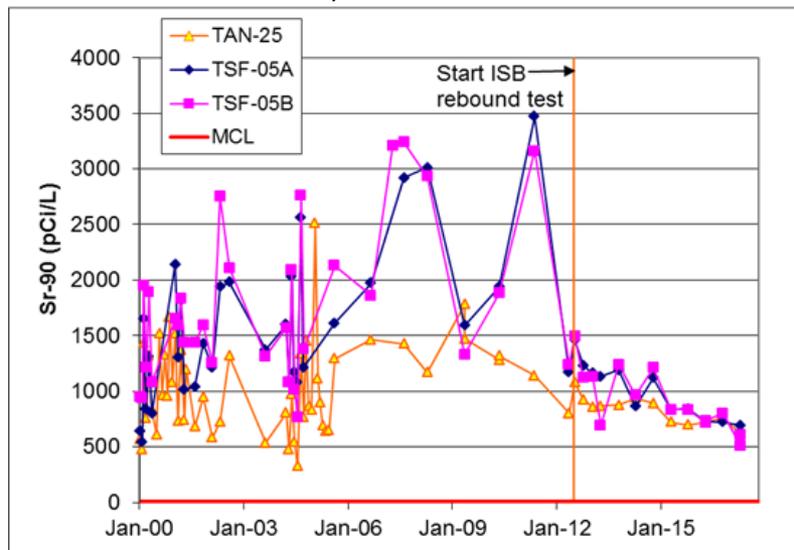
Well TAN-2312, drilled in 2017, provides information regarding extend of plume expansion

Radionuclide Assessment

- Wells near former Injection well TSF-05 contaminated with Cs-137 and Sr-90.
- ROD allows for radionuclides to attenuate naturally within the remediation timeframe.
- Continue to evaluate trends for Sr-90 and Cs-137 to ensure they will trend down at a rate sufficient to meet the RAOs.
- Cs-137 and Sr-90 concentrations are declining since the start of the rebound test.



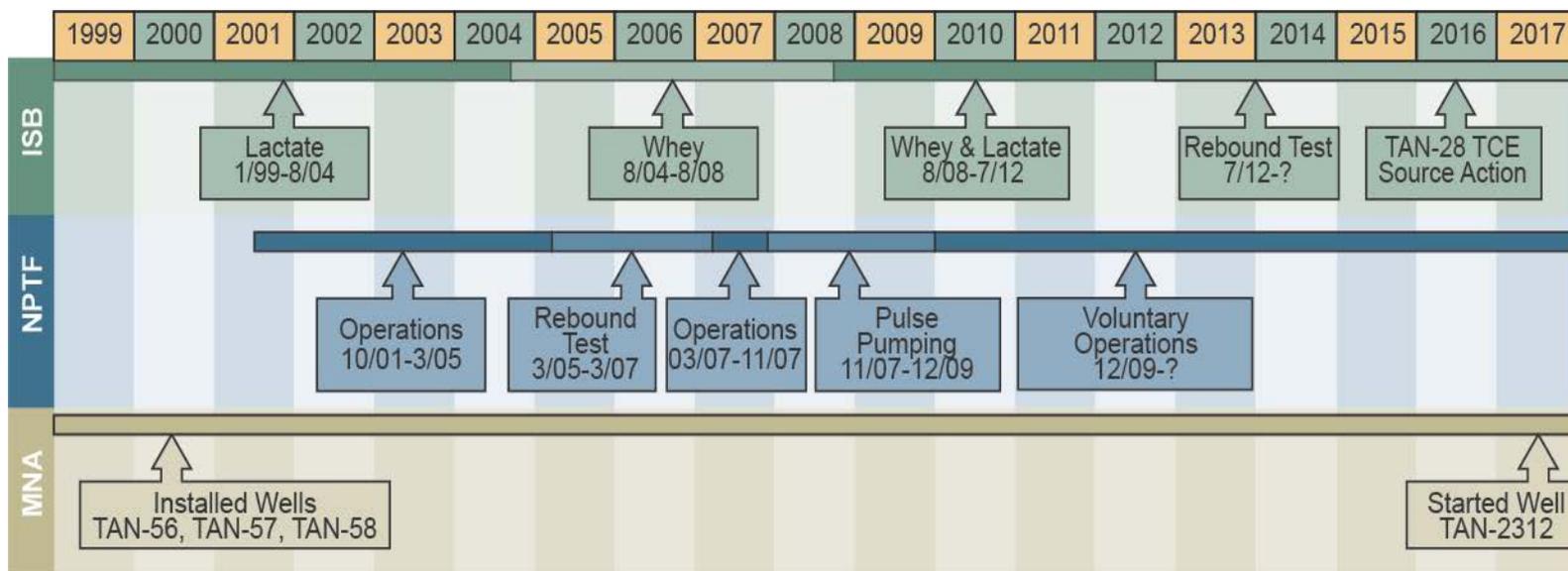
Cs-137 concentrations in key wells



Sr-90 concentrations in key wells

Recent Changes in Remedy Implementation

- Remedy is evaluated through the CERCLA 5 Year Review process.
- Remedy strategy evolves to meet changing conditions.
- Recent changes in strategy include:
 - TAN-28 Source Action (2016)
 - New well drilled in Distal Zone (2017)



ISB = In-situ bioremediation – Hot Spot
 NPTF = New Pump and Treat Facility – Medial Zone
 MNA = monitored natural attenuation – Distal zone

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Remedy Performance Status

- Hot Spot
 - Partial ISB Rebound Test is ongoing to evaluate residual VOC source.
 - TAN-28 Source Action
 - Limited ISB injections resumed into one well (TAN-37) in an attempt to treat the TAN-28 TCE source.
- Medial Zone
 - Pump and treat continues to be effective at reducing TCE concentrations migrating into the MNA area.
- Distal Zone
 - MNA wells on track to meet RAOs by 2095 and plume expansion remains less than 30%.
- Radionuclide Assessment
 - Radionuclide concentrations are declining
- Remedy is performing as expected and exposure pathways that could result in unacceptable risk are being controlled

Backup Slides

TAN Decision Documents

- OU 1-07B ROD (1995)
 - Original remedy to address groundwater contamination pump and treat for entire plume
 - Allowed for treatability studies
- OU 1-07B ESD (1997)
 - Divided Plume into three zones based on TCE concentration (i.e., hot spot, medial zone, and distal zone)
- OU 1-07B ROD Amendment (2001)
 - Modified the original remedy to integrate three remedy components to address the three zones of the plume

