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Confidential Settlement Communication
Subject to FRE Rule 408

VIA E-MAIL AND U.S. MAIL

TO: Jay Manning
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RE: **Holden Mine Remedial Alternative 9**

At the September 29, 2005, management meeting in Olympia, I expressed Intalco's concern that we are at a fork in the road, with a choice between Alternative 3b, preferred by Intalco and the 2005 APR, currently preferred by the Agencies. Intalco believes that Alternative 3b is protective. The Agencies have expressed their preference that more be done in the East Area, primarily to address concerns with regard to iron. Intalco hopes that we can avoid an impasse. This letter transmits a new alternative, Alternative 9, in an effort to reach a global settlement and address the Agencies' concerns with the eastern portion of the site. The attached memo describes and evaluates Alternative 9 using the CERCLA and MTCA remedy selection criteria.

Intalco remains convinced that Alternative 3b is protective of human health and the environment, would comply with potential ARARs, and would achieve the same environmental benefits as the 2005 APR while being more reliable and cost effective and

having fewer short-term impacts on Holden Village. Although Alternative 3b remains Intalco's preferred remedy, Intalco and its consultants have developed the attached proposed new remedial Alternative 9 and hopes that it will be accepted as a consensus remedial alternative, which in turn can lead to an overall resolution of remedial and NRD issues at Holden Mine.

Alternative 9 incorporates many of the common elements of the remedial alternatives described in the 2004 Draft Final Feasibility Study (DFFS). It includes remedial components common to Alternative 3b with respect to West Area sources. Alternative 9 also includes the collection and treatment of groundwater sources in the East Area at Tailings Pile 1, which contributes the majority of the iron and aluminum loading from the East Area.[1] As with Alternative 3b, treatment would be provided in a low energy treatment system located in the West Area.[2]

With Alternative 9, dissolved iron concentrations in Railroad Creek are expected to achieve the potential ARAR in the short term, and copper, cadmium and zinc concentrations are expected to achieve potential ARARs in the same 50-year time frame as the 2005 APR. Alternative 9 would be more reliable and would have fewer impacts on the Holden Village community, for the reasons expressed in Intalco's September 2005 submission to the NRRB and URS' August 2005 memorandum. Alternative 9 is estimated to cost $36.2 million whereas the 2005 APR is estimated to cost $70.6 million, almost twice as much. Because the environmental benefits of Alternative 9 and the 2005 APR are comparable, Alternative 9 should be preferred over the 2005 APR.

Intalco's submission of Alternative 9 is conditioned on our ability to reach a global remedy and NRD agreement embodied in a consent decree. In particular, we note the following key areas where agreement must be reached, among others:

- Agreement on scope of monitoring and method to monitor the point of compliance.
- Agreement on ARARs and remedial action objectives.

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[1] Alternative 9 has the added benefit of capturing and treating a modest amount of additional cadmium, copper and zinc from the East Area, while the majority of the loading from these metals originates from the West Area and would be addressed by the Alternative 3b components included in Alternative 9.

[2] For clarity, it is also important to point out what is not included in Intalco's proposed Alternative 9. In particular, Alternative 9 does not include a 45 foot tailings setback, regrading and/or relocation of waste rock piles, or sediment removal.

- Agreement on NRD restoration projects or compensation.
- Agreement on the terms of a global consent decree.

At our management meeting on September 29, 2005, I stated that Intalco would be willing to be flexible to address Agency concerns in the context of a remedy that costs approximately the same as Alternative 3b. Intalco has gone the extra mile. Alternative 9 is more expensive than Alternative 3b and represents a significant concession, given Intalco's continued belief that Alternative 3b is protective and produces environmental benefits comparable to the APR. Intalco looks forward to further discussions with the Agencies concerning Alternative 9. However, given that Intalco has gone the extra mile, I hope you will understand that Intalco will not be receptive to modifications to Alternative 9 that increase overall costs.

Intalco will shortly be submitting, under separate cover, a memorandum discussing the key regulatory and technical concerns raised by the Agencies with respect to Alternative 3b, which we hope will provide some added perspective on the remedy selection issues. Because many of the remedial components and issues are common, the issues discussed in the memorandum will also apply to Alternative 9 the 2005 APR.

We look forward to discussing these issues with you.

Sincerely yours,

Theodore L. Garrett

Attachment

cc: David Jackson
Richard Langendoen
Jennifer Barrett

URS

ALTERNATIVE 9 DESCRIPTION AND FOCUSED CERCLA-MTCA FEASIBILITY EVALUATION, HOLDEN MINE SITE, CHELAN COUNTY, WA

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Prepared for Intalco Aluminum Co.

November 17, 2005

URS Job No. 33750803

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TABLE OF CONTENTS

FIGURES

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ALTERNATIVE 9 DESCRIPTION AND FOCUSED CERCLA-MTCA FEASIBILITY EVALUATION, HOLDEN MINE SITE, CHELAN COUNTY, WA

1.0 INTRODUCTION

This memorandum presents an alternate remedial action approach, Alternative 9, for consideration for the Holden Mine Site, located in Chelan County, Washington. Please note that Intalco continues to support Alternative 3b, as presented in the Draft Final Feasibility Study (DFFS), dated February 19, 2004. Following implementation, Alternative 3b would be protective of human health and the environment, and would comply with potentially applicable, or relevant and appropriate requirements (ARARs) within an acceptable restoration time frame.[1]

While Alternative 3b is Intalco's preferred remedy, an alternate approach, Alternative 9, has been developed in the interest of reaching a global settlement and addressing the Agencies' concerns regarding metals loading to Railroad Creek from the eastern portion of the Site. Alternative 9 would address the primary sources of cadmium, copper, and zinc loading to Railroad Creek using the same remedial components described for Alternative 3b.

The new feature in Alternative 9 is the collection and treatment of groundwater and seeps associated with tailings pile 1. The additional tailings pile 1 groundwater collection system would reduce iron and aluminum loading to Railroad Creek and dissolved iron concentrations in Railroad Creek would achieve the potential ARAR in the short term. Alternative 9 would have the added benefit of capturing some additional cadmium, copper, and zinc loading from the East Area, although the majority of the loading for these metals originates in the West Area and would be addressed by the Alternative 3b remedial components included in Alternative 9.

As discussed below, Alternative 9 is anticipated to provide similar environmental benefits as the Agencies' 2005 Proposed Remedy (APR), with greater reliability and less short-term impacts to the Holden Village community. Alternative 9 and the APR would be protective of ecological receptors and would achieve potential ARARs within the same restoration time frame (50 years). Additionally, Alternative 9 would have a higher degree of implementability and would be dramatically more cost-effective. The additional estimated costs associated with implementation of the APR are clearly disproportionate to the predicted environmental benefit when compared to either Alternatives 3b or 9.

The unique remedial components included under Alternative 9, and a comparative analysis of Alternative 9 and the APR with respect to the nine CERCLA evaluation criteria are provided below. Requirements related to remedy selection under the Washington State Model Toxics Control Act

[1]As described in Intalco's submittal to the USEPA National Remedy Review Board (NRRB), dated September 20, 2005, Alternative 3b is predicted to achieve the same environmental benefits as the Agencies' Proposed Remedy (APR) within the same restoration time frame. However, Alternative 3b would be more reliable and significantly more cost effective to implement.

(MTCA) were also evaluated and are discussed within each of the CERCLA criteria evaluations, as appropriate. The CERCLA and MTCA evaluation criteria are discussed in greater detail in the DFFS.

2.0 DESCRIPTION OF ALTERNATIVE 9

Alternative 9 includes components common to Alternative 3b and additional components discussed below. Alternative 9 includes the following remedial components as described for Alternative 3b in Section 6 of the DFFS:

- Diversion of upgradient surface and near-surface water around east and West Area features;
- Closure of the tailings pile 1 decant tower;
- Regrading to improve drainage and enhanced revegetation of the tailings piles;
- Regrading and revegetating the side slopes of tailings piles 1 and 2 and placement of rip rap or other form of armoring at the base of all three tailings piles[2];
- Downgradient collection and treatment of the portal drainage and West Area seeps SP-23 and SP-12;
- Installation of a barrier wall and collection system in the upper West Area to collect groundwater and seeps immediately downgradient of the east and west waste rock piles, mill building, and maintenance yard;
- Portal drainage flow retention and equalization using hydrostatic bulkheads installed within the mine or an alternative method, such as above-ground retention basins; and
- Low-energy treatment of collected West Area groundwater and seeps at a location within the lower West Area.

The Alternative 3b remedial components listed above are predicted to achieve potential ARARs within 50 years, the same restoration time frame as the APR, and to be protective of human health and ecological receptors in the short term. However, to address the Agencies' concerns with respect to additional metals loading from the East Area (primarily iron and aluminum), Alternative 9 includes groundwater extraction and interception systems installed at tailings pile 1, including the collection of seeps SP-1 and SP-2, and the installation of groundwater pumping wells. These additional systems, combined with the barrier wall and groundwater collection system installed upgradient of the East Area (at the base of the east and west waste rock piles), are expected to significantly reduce the metals loading from tailings pile 1 to Railroad Creek.

[2] The existing tailings piles 1 and 2 side slopes would be regraded to a final slope of approximately 2:1 (26% slope angle). Alternatives 3b and 9 do not include excavating tailings to provide a 45-foot bench between the tailings piles and Railroad Creek.

In responding to the Agencies' concern with the East Area, it is reasonable to focus on tailings pile 1, which contributes a majority of the incremental metals loading from the East Area. For example, tailings pile 1 contributes approximately 78 percent of the total iron loading from the East Area in the fall, when iron concentrations in Railroad Creek are the highest, and most of the iron and aluminum loading from East Area sources throughout the year. The interception and treatment of groundwater and seeps associated with tailings pile 1 will also result in a modest reduction of other metals.[3]

The principal components of Alternative 9 are shown on Figure 1 and additional description of the groundwater extraction and interception systems is provided below.

2.1 Tailings Pile 1 Groundwater Extraction Wells

As shown conceptually on Figures 1 through 3, groundwater extraction wells would be installed along the northeastern edge of tailings pile 1 near the crest of the regraded side slope. The extraction system is based on the collection of approximately 60 gallons per minute of groundwater, targeting areas with relatively high concentrations. Based on available chemistry data from groundwater monitoring wells TP1-2, TP1-3, and TP1-4, it is estimated that a total of four wells, each pumping at a rate of approximately 15 gallons per minute, would be sufficient. However, the final number and location of the extraction wells would be determined during the remedial design. The wells would be placed at depths to maximize the extraction of shallow groundwater located within the upper 10 feet of the native soils beneath the tailings.

Groundwater extracted from tailings pile 1 would be transferred to the West Area and combined with the portal drainage and collected West Area groundwater and seeps for treatment. The East Area water would either be pumped to the 1500-level and combined with the portal drainage, or pumped to the maintenance yard area and combined with the portal drainage and other West Area waters prior to treatment. These design details would be evaluated during the remedial design to maximize treatment efficiencies.

2.2 Interception of Seeps SP-1 and SP-2

Under Alternative 9, groundwater interception systems would be installed to capture tailings pile 1 seeps SP-1 and SP-2, and associated shallow groundwater. The interception systems would consist of subsurface toe drains and collection tanks designed to minimize air infiltration and reduce the potential for the precipitation of iron and other metals within the system. Conceptual plan-view and cross-sectional drawings of the interception systems are provided on Figures 4 through 10.

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[3] Although the tailings piles are only a minor source of other metals such as zinc, groundwater and seeps originating from tailings pile 1 contribute the majority, approximately 62 percent, of the additional zinc loading from the East Area during spring high-flow conditions, when zinc concentrations are the highest in Railroad Creek.

As described for the groundwater extraction wells above, intercepted East Area groundwater would be pumped to the West Area for treatment with the portal drainage and collected West Area groundwater and seeps.

3.0 COMPLIANCE WITH ARARS

A comparative analysis of Alternative 9 and the APR with respect to surface-water, groundwater, soil, location-specific, and action-specific ARARs is provided below.

3.1 Surface Water ARARs

Both Alternative 9 and the APR would address the primary sources of cadmium, copper, and zinc loading to Railroad Creek through a combination of source control actions and downgradient collection and treatment. As a result, both alternatives are anticipated to provide significant improvements in Railroad Creek water quality in the short term following remedy implementation. Although Alternative 3b is predicted to achieve potential ARARs in the same time frame (50 years) as the APR, Alternative 9 would reduce the restoration time frame for iron. Under Alternative 9, dissolved iron concentrations are predicted to achieve the potential ARAR in the short term. The tailings pile 1 actions included under Alternative 9 would also collect a modest amount of additional cadmium, copper, and zinc loads, whereas most of the loads for these metals originate in the West Area and would be addressed by the Alternative 3b remedial components included under Alternative 9.

Copper, Cadmium, and Zinc. Due to several factors, including natural background concentrations and low hardness values in Railroad Creek (resulting in very low calculated surface water quality criteria for dissolved cadmium and copper) neither Alternative 9 nor the APR is predicted to achieve the Agencies' proposed ARARs for these metals in the short term. However, through ongoing natural attenuation, which both CERCLA and MTCA recognize for remedy selection, it is predicted that both alternatives would achieve potential ARARs within approximately 50 years. Because of the difficult site conditions and the significant short-term surface water quality improvements that would be achieved by Alternatives 3b, 9, and the APR, 50 years is considered to be a reasonable restoration time frame. Section 7 of the DFFS evaluates the nine factors that must be considered under MTCA for the determination of a reasonable restoration timeframe.

The predicted restoration time frame for each alternative is based on the results of the post-remediation loading analysis model, which was developed with Agency input and presented in the DFFS. Long-term post-remediation modeling results for dissolved cadmium, copper, and zinc are presented on Figures 11 through 13. For purposes of this evaluation, predicted post-remediation concentrations were compared to the more stringent of the State Water Quality Criteria (SWQC) and the 2004 National Recommended Water Quality Criteria (NRWQC). However, technical documentation submitted in the DFFS demonstrate that the SWQC and NRWQC are based on species that do not inhabit Railroad or Copper Creeks, and are therefore not relevant or appropriate to the Holden mine Site.

Due to concerns related to the reliability and effectiveness of the partially penetrating cutoff wall (PPC) included under the APR for the collection of east and West Area groundwater and seeps, two APR scenarios (assuming 50% and 80% collection efficiencies) were evaluated. As shown on Figures 11 through 13, potential ARARs are predicted to be achieved within similar restoration time frames for both APR scenarios and Alternative 9.

Iron and Aluminum. While it is Intalco's position that iron and aluminum are not hazardous substances for purposes of liability under CERCLA and MTCA and should not be the basis for remedy selection, iron and aluminum loading to Railroad Creek would be significantly reduced under both Alternative 9 and the APR. As shown on Figure 14, dissolved iron concentrations are expected to drop below the potential ARAR in the short term following implementation of both Alternative 9 and the APR. Aluminum concentrations are expected to follow a trend similar to iron. However, total aluminum concentrations have been observed to exceed the Agencies' proposed ARAR in Railroad Creek upgradient of the Site due to natural background conditions. Because it would be impossible to have a zero load contribution from Site sources under any alternative for aluminum, achievement of the proposed ARAR would be impractical. However, as discussed below, predicted post-remediation aluminum concentrations adjacent to and downstream of the Site are not expected to adversely affect aquatic life in Railroad Creek.

3.2 Groundwater ARARS

Under MTCA, if it is not practicable to meet groundwater cleanup levels throughout the Site within a reasonable restoration time frame, a conditional point of compliance (CPOC) may be approved. If the property directly abuts surface water, and the groundwater cleanup levels are based on the protection of surface water beneficial uses, a CPOC that is located within surface water, as close as technically possible to the point or points where groundwater flows into surface water, may be approved if specific conditions are met (WAC 173-340-720(8)(d)(i)).

Due to the site conditions, a CPOC for groundwater would be appropriate for both Alternative 9 and the APR. In their September 2005 submittal to the NRRB, the Agencies' concur that a CPOC for Site groundwater would be appropriate, if measures to prevent or minimize groundwater releases to surface water are implemented to the extent practicable. Alternative 9 meets the requirements under MTCA for establishing a CPOC in surface water, including the requirement to apply all known and reasonable methods of treatment (AKART) to groundwater prior to release into Railroad or Copper Creeks. The term "AKART" refers to the use of all practicable methods of treatment at a reasonable cost (WAC 173-340-200). Alternative 9 would address all the primary sources of metals loading to Railroad Creek through a combination of source control actions and the interception and treatment of groundwater and seeps directly downgradient of their respective sources, where the depth to relatively impermeable till is known and collection efficiencies can be reliably predicted.

In contrast, the 2005 APR would allow contaminated groundwater in the West Area to continue to flow downgradient toward the south bank of Railroad Creek, where it would be intercepted with a PPC installed adjacent to the Creek. The depth to relatively impermeable till is between 30 and 50 feet at this

location, and due to the highly variable hydraulic conductivity, along with significant seasonal fluctuations in both groundwater and surface water elevations, it is likely that the PPC will leak and not be reliable. Therefore, elevated metals concentrations would occur at a CPOC at the south bank of Railroad creek wherever groundwater leaks beneath the PPC.

In the East Area of the Site, where the depth of the alluvial material varies between 20 to 100 feet, the technical concerns related to the reliability of the PPC are more pronounced. Due to these concerns related to the reliability the PPC, as well as concerns related to implementability and cost, the APR is not considered to be AKART.

Both Alternative 9 and the APR rely on natural attenuation to achieve potential ARARs in the long term at the CPOC. The predicted metals concentrations in a fully mixed Railroad Creek are similar under both Alternative 9 and the APR. Therefore, the total overall load entering the south bank of Railroad Creek via uncollected seeps and groundwater would also be similar. Because the loads at the south bank would be similar, it is likely that the concentrations of CPOCs at the south bank would also be similar. Therefore, the potential for exceedances of potential ARARs at the conditional point of compliance does not provide a basis for selecting one remedy over the other.

Both alternatives are anticipated to provide significant improvements in water quality at the south bank of Railroad Creek in the short term, and through natural attenuation, metals concentrations at the south bank are predicted to continue to improve and eventually achieve ARARs over the long term.

3.3 Soil ARARs

The Agency-approved Ecological Risk Assessment (ERA) included in the DRI demonstrates that there is no risk to most ecological receptors and low potential risk to select plants, soil biota, and wildlife due to soils in limited areas of the Site. Both Alternative 9 and the APR would address the low potential risk to select receptors through a combination of capping and soil removal actions in the mill building, maintenance yard, lagoon area, and former surface water retention area located downslope of the 1500-level ventilator portal.

The tailings piles and waste rock piles would be addressed under the Solid Waste Management Handling regulations (Chapter 173-350 WAC). As described below, the tailings piles and waste rock piles would meet the relevant and appropriate requirements for solid waste handling related to limited purpose landfills, including select provisions for closure systems and post-closure care. The Agencies have included the placement of a soil cover on the tailings piles under the APR to promote revegetation. However, it is evident that significant revegetation has already occurred and continues to occur on the tailings piles since the USDA Forest Service placed a gravel cover and initiated revegetation test plots on the tailings piles in the early 1990's. It may also be appropriate to leave certain portions of the tailings free of vegetation for use by the Holden Village as an emergency evacuation location in the event of a forest fire.

3.4 Location-specific and Action-specific ARARs

Both Alternative 9 and the APR would meet all potentially applicable location- and action-specific ARARs. The specific requirements of these ARARs would be identified through consultation with federal and state agencies during the remedial design and remedy implementation. Construction activities would be conducted to minimize potential impacts to fish and wildlife, and substantive compliance with Clean Water Act (CWA) stormwater requirements, CWA Section 401 Water Quality Certification, and CWA Section 404 would also be addressed.

Under both alternatives, the tailings piles and waste rock piles would meet the specific relevant and appropriate provisions of the Solid Waste Management Handling regulations (Chapter 173-350 WAC) related to limited purpose landfills. The relevant and appropriate requirements of the limited purpose landfill regulations include select provisions for closure systems and post-closure care under WAC 173-350-400(3)(e)(i)(A) through (J) and 173-350-400(7)(a). Variance requirements under WAC 173-350-710 are also potentially relevant and appropriate, and both alternatives would require variances from one or more of the closure system/post-closure care requirements for the tailings and waste rock piles. The specific relevance and appropriateness of these requirements will be further evaluated during the remedial design.

Note that there is no regulatory basis under MTCA or CERCLA to require the relocation of tailings to provide a 45-foot bench between the piles and Railroad Creek, or the regrading, soil cover, and revegetation of the waste rock piles as included under the APR. The location and design standards of the limited purpose landfill regulations, which were cited by the Agencies as reasons for these actions, are not applicable because the tailings and waste rock piles were not considered solid waste when placed on the land and these areas were closed prior to the applicable date of the regulations (2003). The location and design standards are also not relevant and appropriate to Alternative 9, because Alternative 9 addresses concerns related to slope stability and the potential for losses of tailings to Railroad Creek during high-water events through other reliable engineering controls.

4.0 OVERALL PROTECTION OF HUMAN HEALTH AND THE ENVIRONMENT

A comparative analysis of Alternative 9 and the APR with respect to the overall protection of human health and the environment, including the protection of human health and ecological receptors, the protection of aquatic receptors, and the potential for short-term impacts is provided below.

4.1 Protection of Human Health and Ecological Receptors

The human health risk assessment found no existing unacceptable risks to Holden Village residents or visitors based on reasonable maximum exposure to PCOCs at the Site. Both Alternative 9 and the APR would eliminate potential future risks associated with the use of groundwater as a drinking water source through the implementation of land use restrictions. Both alternatives would also reduce potential physical risks to Holden Village residents and visitors through the installation and maintenance of physical access restrictions around the mill building and underground mine portals.

As described above, both Alternative 9 and the APR would address the low potential risk to select terrestrial ecological receptors through a combination of capping and soil removal actions in the mill building, maintenance yard, lagoon area, and former surface water retention area located downslope of the 1500-level ventilator portal.

4.2 Protection of Aquatic Life

Both Alternative 9 and the APR are predicted to achieve potential surface-water ARARs that are established for the protection of aquatic life within similar restoration time frames (approximately 50 years).

With respect to short-term protectiveness, a toxicological assessment of predicted short-term post-remediation water quality was completed by Intalco's consultant, Dr. Stephen R. Hansen, and provided in Appendix H of the DFFS. A subsequent assessment of additional toxicological information provided by the Agencies further supported the findings presented in Appendix H. This assessment was provided to the agencies on June 17, 2005, and was included as Attachment 2 to Intalco's NRRB submittal.

Dr. Hansen's assessments examine the literature relied on by EPA in publishing National Recommended Water Quality Criteria (NRWQC) and indigenous species present in Railroad Creek and conclude that short-term post-remediation concentrations of aluminum, cadmium, copper, zinc, and iron anticipated under DFFS Alternative 3b will not adversely impact the aquatic community, including salmonids and their food supply. Both Alternative 9 and the APR are predicted to achieve greater short-term reductions in PCOC concentrations in Railroad Creek than estimated for Alternative 3b. As a result, both alternatives are anticipated to be protective of aquatic life in Railroad Creek following implementation.

4.3 Potential for Short-term Impacts to Workers and the Local Community

The implementation of appropriate health and safety measures and close coordination with the Holden Village during construction would reduce safety risks to workers, Holden Village residents, and visitors under both Alternative 9 and the APR. Under both alternatives, a temporary stream crossing would be constructed over Railroad Creek at the downstream edge of tailings pile 3 to allow vehicles and equipment to bypass the Holden Village during construction activities. The APR would involve the following major construction activities that are not included under Alternative 9: the relocation of approximately 500,000 cubic yards of tailings to provide a 45-foot bench between the base of the tailings piles and Railroad Creek; regrading and relocating approximately 158,000 cubic yards of waste rock; and construction of the PPC. These additional construction activities would result in adding a construction season, increased traffic, safety risks, and potential disruption to Holden Village facilities. A comparison of potential impacts to Holden Village operations resulting from the implementation of the APR and Alternative 3b (which is similar to Alternative 9) was provided in a memorandum from URS to the Holden Village, dated August 19, 2005.

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5.0 LONG-TERM EFFECTIVENESS AND PERMANENCE

Both Alternative 9 and the APR would provide permanent removal of metals from the portal drainage and collected groundwater through treatment and the disposal of treatment residues on site. The source control and groundwater collection and treatment technologies included under Alternative 9 are expected to be reliable and effective over the long-term. Alternative 9 would use proven technologies to collect Site groundwater and seeps immediately downgradient of West Area sources where they can be reliably intercepted. Groundwater beneath tailings pile 1 would be collected using subsurface drains and pumps that would operate without introducing atmospheric oxygen. Provisions for a routine maintenance program, such as cleanout ports and pig launchers, would be also built into the system to maintain reliable operation. Additionally, constructing the treatment system in the West Area allows for the use of existing topographical relief to provide aeration and water transport without the use of mechanical aeration and large pumping systems.

In contrast, there are significant concerns related to the long-term effectiveness and permanence of the PPC and water treatment system included under the APR. As described above, due to a high range of hydraulic conductivity in the subsurface along the south bank of Railroad Creek, along with the seasonal fluctuations in both groundwater and surface water elevations at this location, there are significant concerns that the PPC will leak and not be reliable. Groundwater and surface-water elevation fluctuations are most pronounced during spring high-flow periods, when ARARs will be most difficult to meet. Leakage beneath the PPC would result in the loss of water from the collection system to Railroad Creek, and at other locations or times, the movement of excess clean water from Railroad Creek to the collection system. Leakage from the system would result in the direct discharge of untreated water to Railroad Creek. Excess clean water entering the collection system would result in additional metals loading from the treatment system.

The open groundwater collection system included under the APR would require significant routine maintenance due to the oxidation and precipitation of metals within the system. Difficult site conditions, such as the 500 inches of snowfall the Site received in the winter of 1996/1997, and the length of the APR's open trench system would make it difficult, if not impossible, to inspect and prevent blockages and releases of water from the collection trench due to blockage with ice and snow or iron precipitation.

The difficulties described above would reduce the long-term effectiveness and permanence of the APR relative to Alternative 9.

6.0 REDUCTION OF TOXICITY, MOBILITY, AND VOLUME THROUGH TREATMENT

Both Alternative 9 and the APR would reduce the mobility and toxicity of metals in Site groundwater with collection and treatment and through ongoing natural attenuation processes.

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7.0 SHORT-TERM EFFECTIVENESS

Both Alternative 9 and the APR would address the primary sources of copper, cadmium, and zinc loading to Railroad Creek through a combination of source control actions and downgradient collection and treatment. As a result, both alternatives are anticipated to provide significant improvements in Railroad Creek water quality in the short-term following remedy implementation. Toxicological evaluations conducted by Dr. Stephen R. Hansen indicate that resulting short-term post-remediation concentrations of aluminum, cadmium, copper, zinc, and iron anticipated under Alternative 9 and the APR will not adversely impact the aquatic community, including salmonids and their food supply.

8.0 IMPLEMENTABILITY

Both Alternative 9 and the APR would be implemented using conventional technologies and construction methods. However, the reliance on reliable, low-energy collection and treatment technologies, appropriate for the difficult site conditions, increases the implementability of Alternative 9 relative to the APR. For example, in the West Area, the barrier wall and groundwater collection system would be constructed up on the hillside where the low-permeability till is located at a relatively shallow depth compared to further downgradient and adjacent to Railroad Creek. Additionally, constructing the treatment system in the West Area allows for aeration and water transport by gravity flow. As a result, the low energy requirements for Alternative 9 (estimated to be less than 40 kW) could be readily provided by a small generator and/or seasonally available excess power from the Holden Village's hydroelectric plant.

In contrast, all of the water collected by the PPC and collection trench would need to be pumped to the treatment system located downstream of the Site. This would result in higher power requirements for the APR (approximately 100 kW) compared to Alternative 9. Any excess flow beyond the pumping capacity, and all flows at times of power interruption or pump failure, would result in direct discharges of untreated water to Railroad Creek.

Additionally, highly variable flow rates into the APR collection system are expected due to leakage under the PPC and seasonal snowmelt, thunderstorms, and rain on snow events combined with the larger overall collection area of the PPC relative to the Alternative 3b collection system. These large fluctuations in flow and metals loading to the APR treatment system would substantially increase the difficulty in maintaining proper pH in the APR's treatment system relative to Alternative 9 and increasing the likelihood of system upsets.

9.0 COST EVALUATION

The costs associated with Alternative 9 and the APR as estimated by URS are summarized in the following table:

	Alternative 9	APR
Capital Cost[4]	$21,680,000	$45,082,000
Monitoring and O&M[5]	$6,216,000	$9,250,000[6]
Subtotal	$27,896,000	$54,332,000
Contingency (30%)	$8,369,000	$16,300,000
Total	$36,265,000	$70,632,000

As shown in the above table, the estimated costs associated with the APR are nearly twice that of Alternative 9. However, both alternatives are expected to achieve ARARs within similar restoration time frames (50 years). Based on the results of the short-term loading analysis, during the spring flush, when concentrations of cadmium, copper, and zinc are the highest, Alternative 9 is expected to achieve reductions in total loading to Railroad Creek similar to the expected reductions in load estimated under the APR 50- and 80-percent scenarios. In addition, Alternative 9 is expected to reduce dissolved iron loading to Railroad creek, and dissolved iron is predicted to achieve the potential ARAR in the short term.

Given the comparable environmental benefits of Alternative 9 and the APR, the significant additional costs of the APR (over $34 million more than the cost of Alternative 9) are clearly disproportionate to the predicted environmental benefits.

[4] Note that several remedial components under the APR were not identified by the Agencies until after the cost estimate had been prepared by Intalco, such a pumping station to transfer water to the treatment system inlet on the north side of Railroad Creek. As a result, these costs are not reflected in the estimate above.

[5] Long-term O&M and monitoring costs are provided as present worth (2005) assuming a 7% discount rate.

[6] The long-term O&M and monitoring costs for the APR were provided by Hart Crowser and have not been reviewed in detail or adjusted by URS.

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10.0 SUMMARY

While Alternative 3b is Intalco's preferred remedy, Alternative 9 is being presented as an alternate approach in the interest of reaching a global settlement and addressing Agency concerns regarding metals loading from the eastern portion of the Site.

Alternatives 3b, 9 and the 2005 APR would all achieve potential ARARs within the same restoration time frame (50 years) and would provide significant improvements in Railroad Creek water quality in the short term following remedy implementation. The additional tailings pile 1 groundwater collection system included under Alternative 9 would reduce iron and aluminum loading to Railroad Creek and, like the APR, dissolved iron concentrations in Railroad Creek would achieve the potential ARAR in the short term. Alternative 9 would have the added benefit of capturing some additional cadmium, copper, and zinc loading from the East Area, although most of the loading of these metals is addressed by the remedial components in the West Area.

Alternative 9 would meet the requirement under MTCA that AKART be applied to all groundwater discharges before release to surface water. In comparison to the APR, Alternative 9 is anticipated to provide similar environmental benefit with greater reliability and less short-term impacts to the Holden Village community (see URS' memo, dated August 19, 2005). Alternative 9 would also have a higher degree of implementability and is estimated to cost approximately half as much as the APR.

Given the comparable environmental benefits, there is no justification for selecting the APR at costs greatly in excess of Alternative 9. The incremental cost of the APR (at $71 million) far exceed the estimated cost of Alternative 9 (at $36 million) and result in the APR failing to meet the disproportionate cost criterion for AKART.

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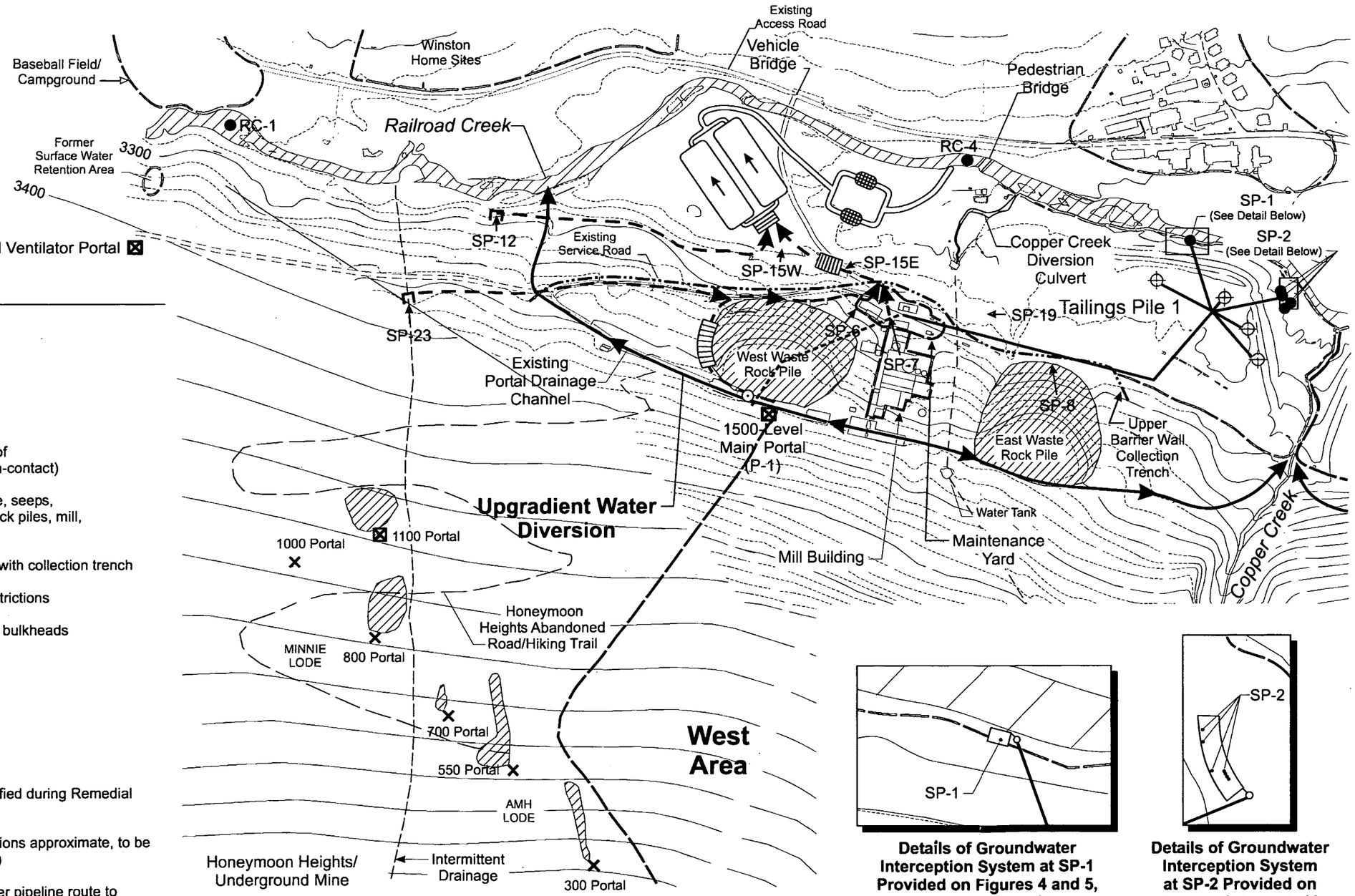
N

0 200 400

Scale in Feet



LEGEND

- Waste rock pile
- Unimproved road
- Dirt road (maintained)
- Approximate limit of site features
- Direction and approximate location of upgradient water diversion flow (non-contact)
- Direction of collected portal drainage, seeps, and contact water from the waste rock piles, mill, and maintenance yard
- Approximate location of barrier wall with collection trench
- Portals to be closed with air-flow restrictions
- Portals to be closed with hydrostatic bulkheads
- Settling ponds
- Media filters
- Mixing and aeration structures
- Chemical addition
- SP-1 ● Number and location of seeps identified during Remedial Investigation
- Groundwater interception well (locations approximate, to be placed near crest of regraded slope)
- Approximate intercepted groundwater pipeline route to Maintenance Yard Area
- Optional intercepted groundwater pipeline route to 1500 level

Details of Groundwater Interception System at SP-1 Provided on Figures 4 and 5, and 8 through 10

Details of Groundwater Interception System at SP-2 Provided on Figures 6 through 10

Figure 1

Principal West Area and Tailings Pile 1 Components of Alternative 9
Holden Mine Site

Job No. 33750803

URS

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Holden Village

0 600

Scale in Feet

Base map information from USFS and Washington DNR, DEM CD ROM

3300

3300

Pedestrian Bridge

RC-4

Existing Access Road

Railroad Creek

SP-1
(See Detail to Right)

SP-2
(See Detail to Right)

Hydroelectric Plant

Copper Creek Diversion Culvert

Storage

SP-19

Tailings Pile 1
Regraded Tailings Pile Surfaces

Pedestrian Bridge (Sven's Bridge)

RC-2

Regraded Tailings Pile Surfaces

Tailings Pile 2

Tailings Pile 3

Upper Barrier Wall Collection Trench

SP-8

East Waste Rock Pile

Decant Tower

Water Tank

Copper Creek

Buried Water Pipes (Approximate)

3600

East Area

3700

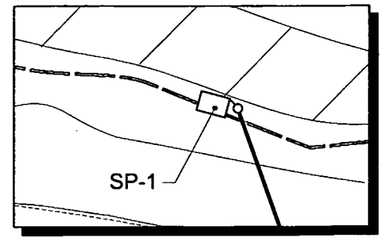
3800

3400

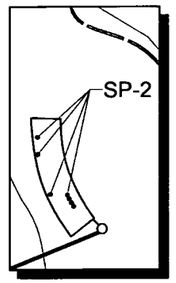
Upgradient Water Diversion

32

3300



Details of Groundwater Interception System at SP-1 Provided on Figures 4 and 5, and 8 through 10



Details of Groundwater Interception System at SP-2 Provided on Figures 6 through 10

LEGEND

- Waste rock pile
- Approximate limit of site features
- Approximate extent of tailings pile regrading
- East Area/West Area boundary
- SP-1● Approximate location of surface water monitoring station/number and location of seep identified during Remedial Investigation
- ⊗ Decant tower closure
- Approximate location of barrier wall with collection trench
- Direction and approximate location of upgradient water diversion flow (non-contact)
- Approximate direction of surface runoff Number and location of seeps identified during Remedial Investigation
- ⊕ Groundwater interception well (locations approximate, to be placed near crest of regraded slope)
- Approximate intercepted groundwater pipeline route to Maintenance Yard Area

Figure 1a

Principal East Area Components of Alternative 9 Holden Mine Site

Job No. 33750803

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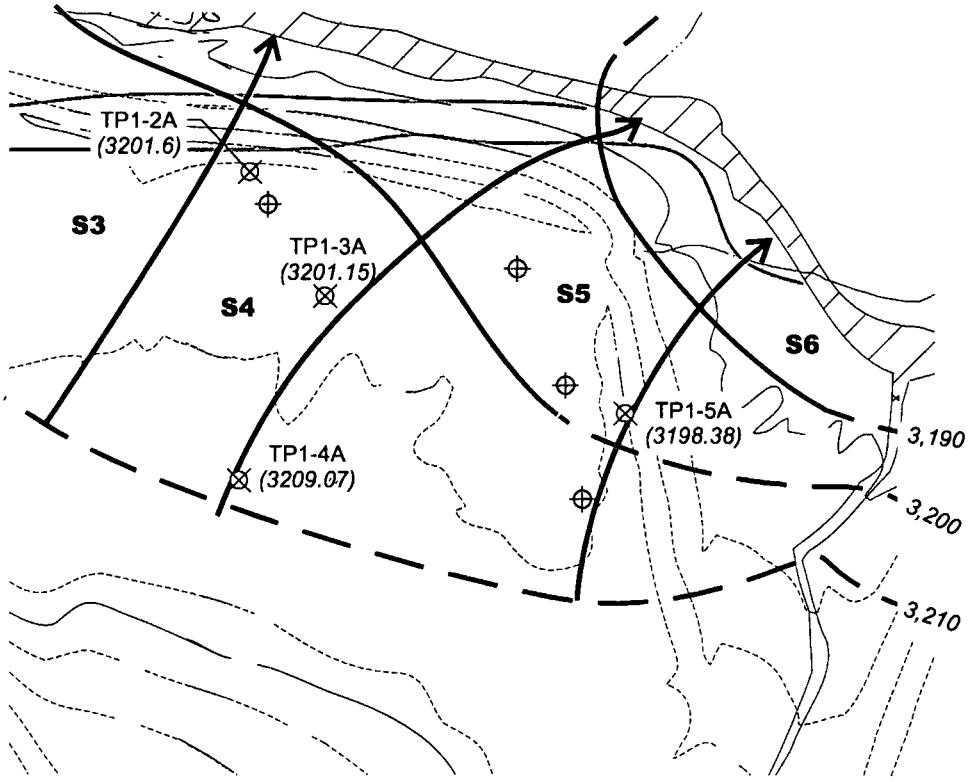
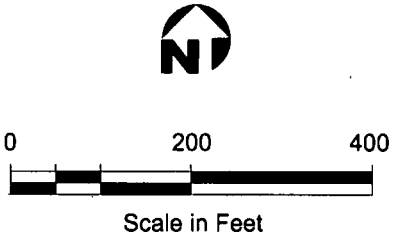


LEGEND

TP1-2 ⊠	Number and surveyed location of groundwater monitoring well completed by others
(*3188.95*)	Groundwater elevation, feet above mean sea level
——— *3,200*	Piezometric surface elevation contour, feet above mean sea level, dashed where inferred
⟶	Inferred groundwater flow path
S1	Flow tube designation
⊕	Groundwater interception well (locations approximate, to be placed near crest of regraded slope that is not shown)



SOURCE: Base map information from USFS and Washington DNR, DEM CD ROM

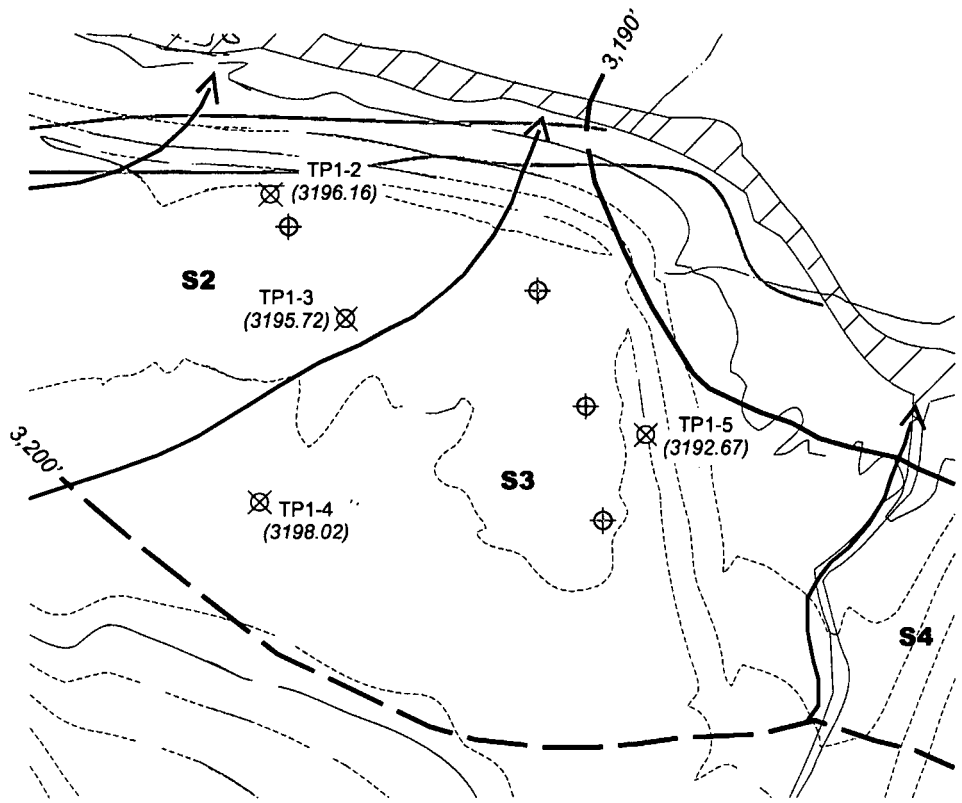
Figure 2

Detail of Conceptual TP1 Groundwater Extraction Wells and May 1997 Flow Net Alternative 9 Holden Mine Site

Job No. 33750803

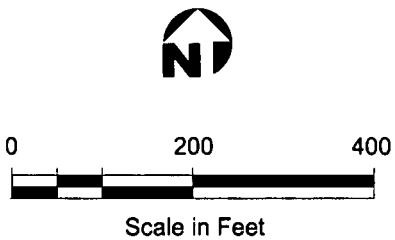
URS

33750803_237.CDR



LEGEND

TP1-2 ⊠	Number and surveyed location of groundwater monitoring well completed by others
(*3188.95*)	Groundwater elevation, feet above mean sea level
——— *3,200*	Piezometric surface elevation contour, feet above mean sea level, dashed where inferred
⟶	Inferred groundwater flow path
S1	Flow tube designation
⊕	Groundwater interception well (locations approximate, to be placed near crest of regraded slope that is not shown)



SOURCE: Base map information from USFS and Washington DNR, DEM CD ROM

Figure 3

Detail of Conceptual TP1 Groundwater Extraction Wells and September 1997 Flow Net Alternative 9 Holden Mine Site

Job No. 33750803

URS

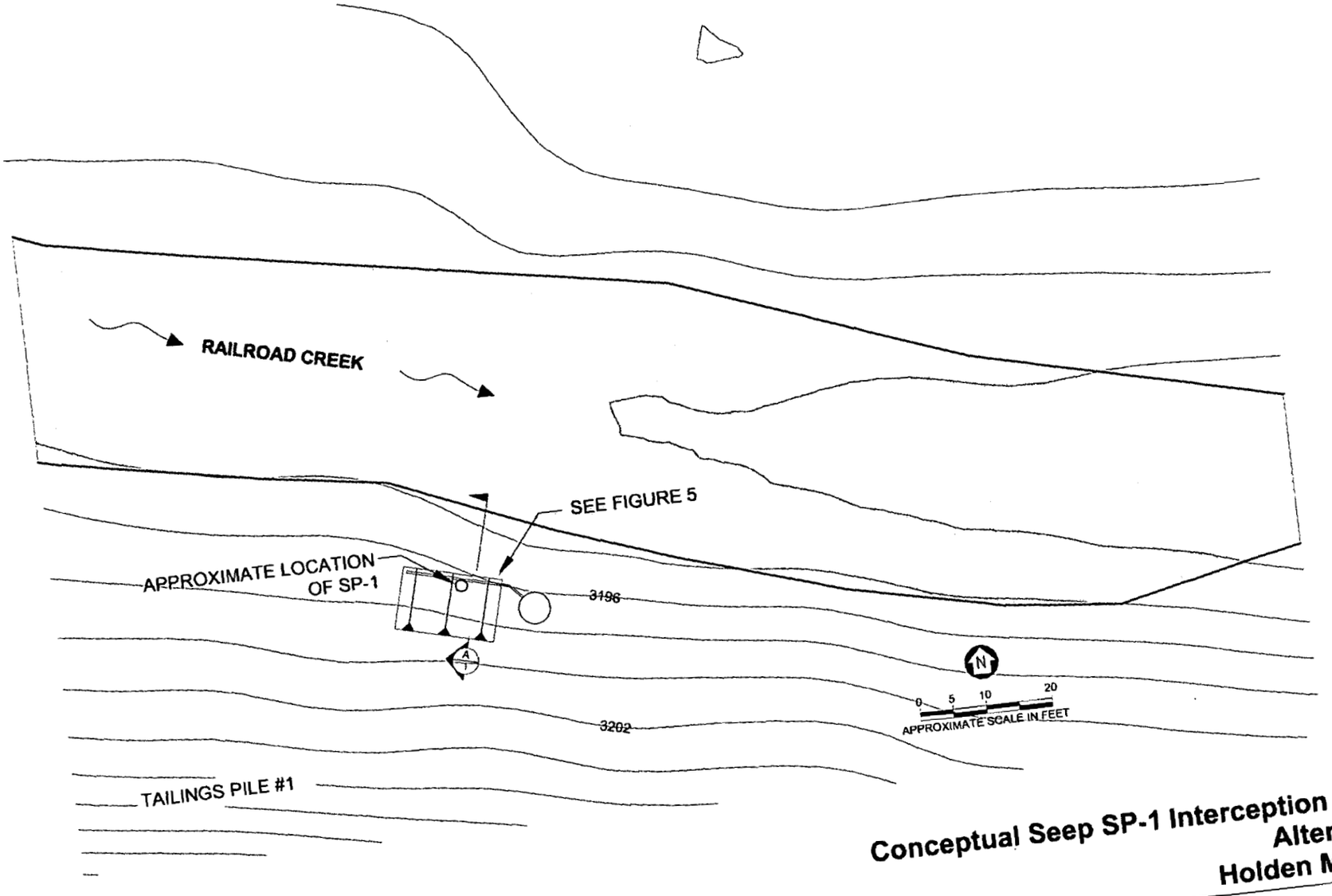
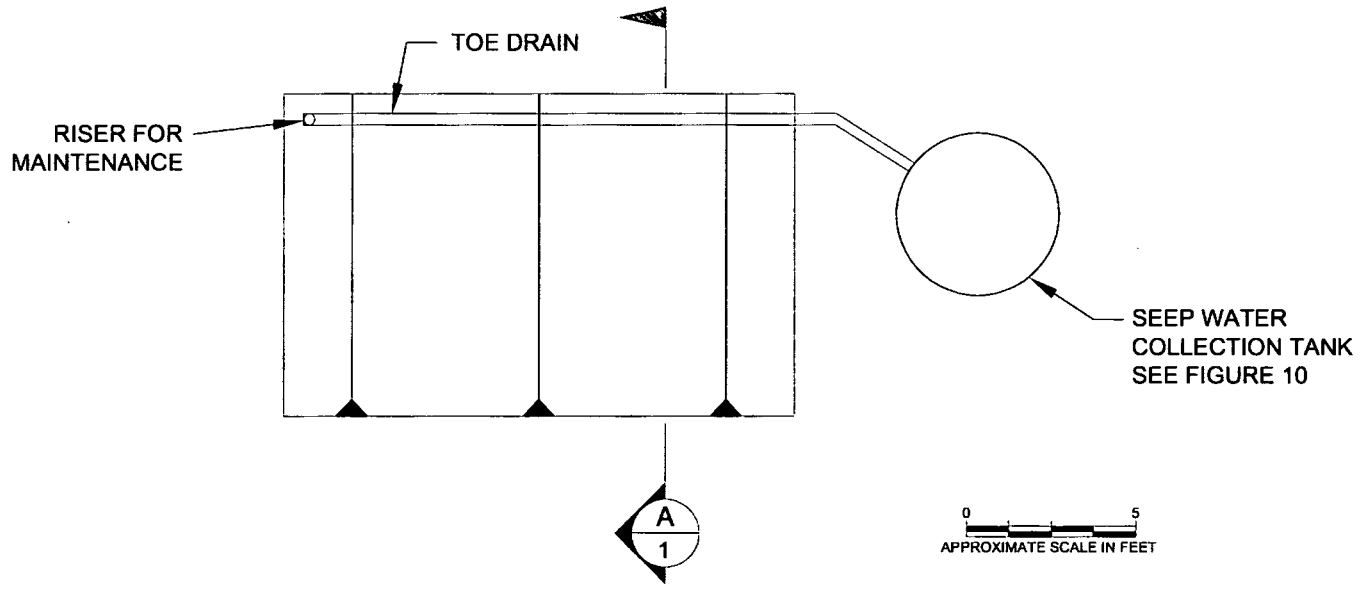


Figure 4

Conceptual Seep SP-1 Interception System Alternative 9 Holden Mine Site

FILENAME: Q:\geo\Holden Mine\SubTasks\Alt 9 memo\SP-1 Figure 4.dwg
EDIT DATE: 11/09/05 AT: 12:15

URS



NOTE:
1. COLLECTION PIPE TO BE SET AT 2% SLOPE TOWARD COLLECTION TANK.

Figure 5

Conceptual Seep SP-1 Interception System
Plan View Drainage Design
Alternative 9
Holden Mine Site

FILENAME: Q:\geo\Holden Mine\SubTasks\Alt 9 memo\SP-1 Figure 5.dwg
EDIT DATE: 11/09/05 AT: 13:29

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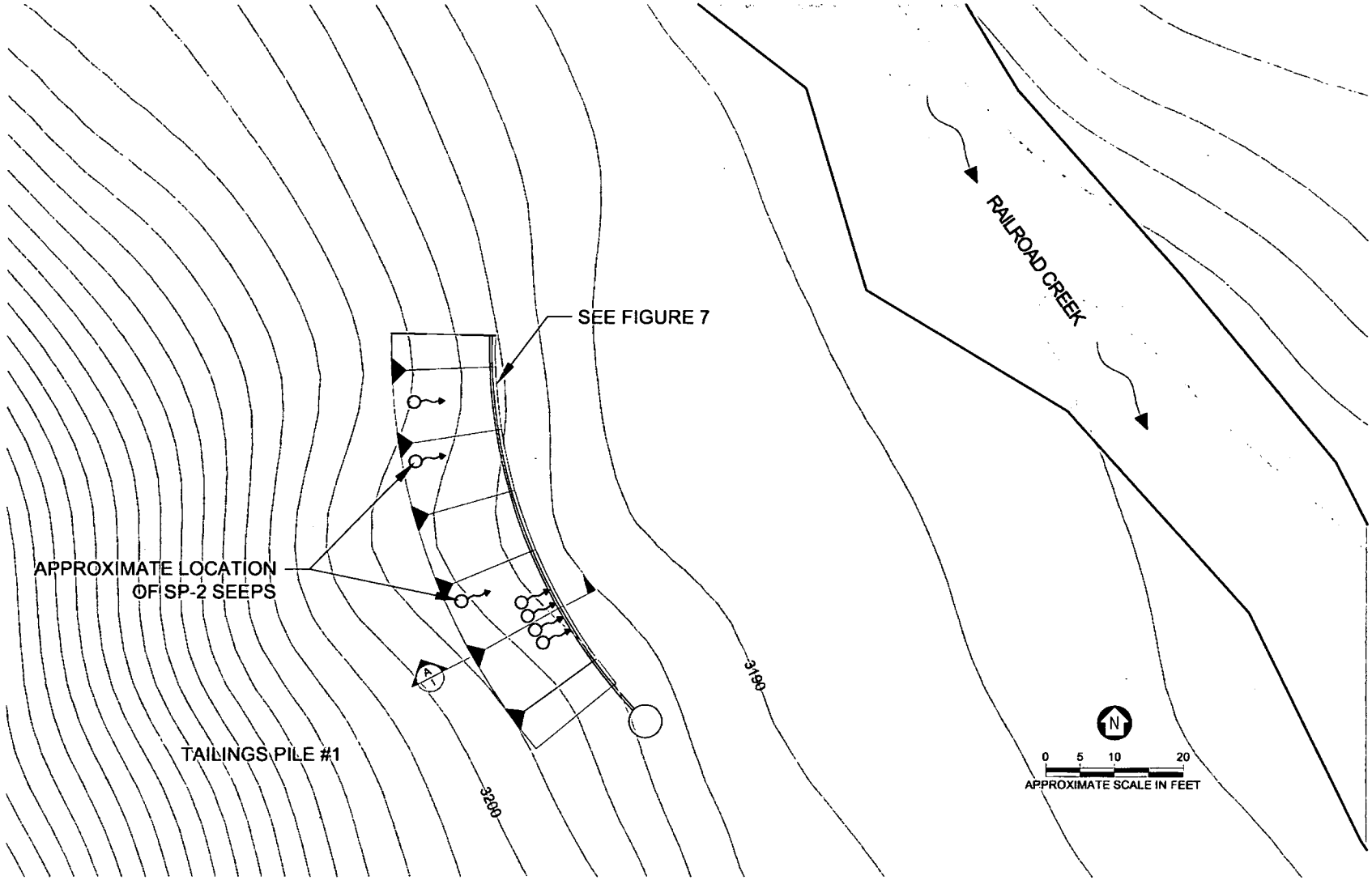

Figure 6

Conceptual Seep SP-2 Interception System Alternative 9 Holden Mine Site

FILENAME: Q:\geo\Holden Mine\SubTasks\Alt 9 memo\SP-2 Figure 6.dwg
EDIT DATE: 11/09/05 AT: 13:31

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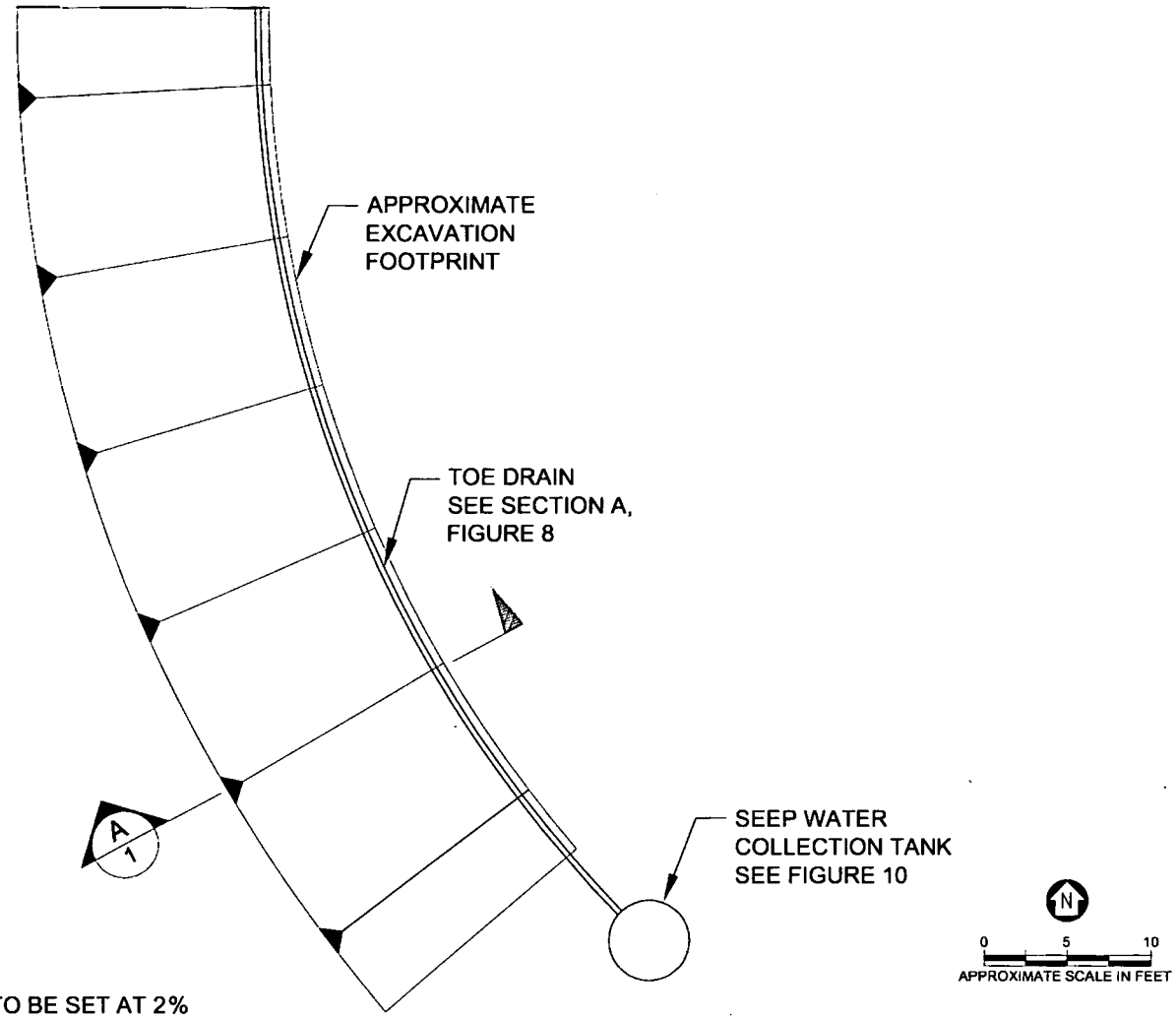

NOTE:
1. COLLECTION PIPE TO BE SET AT 2% SLOPE TOWARD COLLECTION TANK.

Figure 7

Conceptual Seep SP-2 Interception System Plan View Drainage Design Alternative 9 Holden Mine Site

FILENAME: O:\geo\Holden Mine\SubTasks\Alt 9 memo\SP-2 Figure 7.dwg
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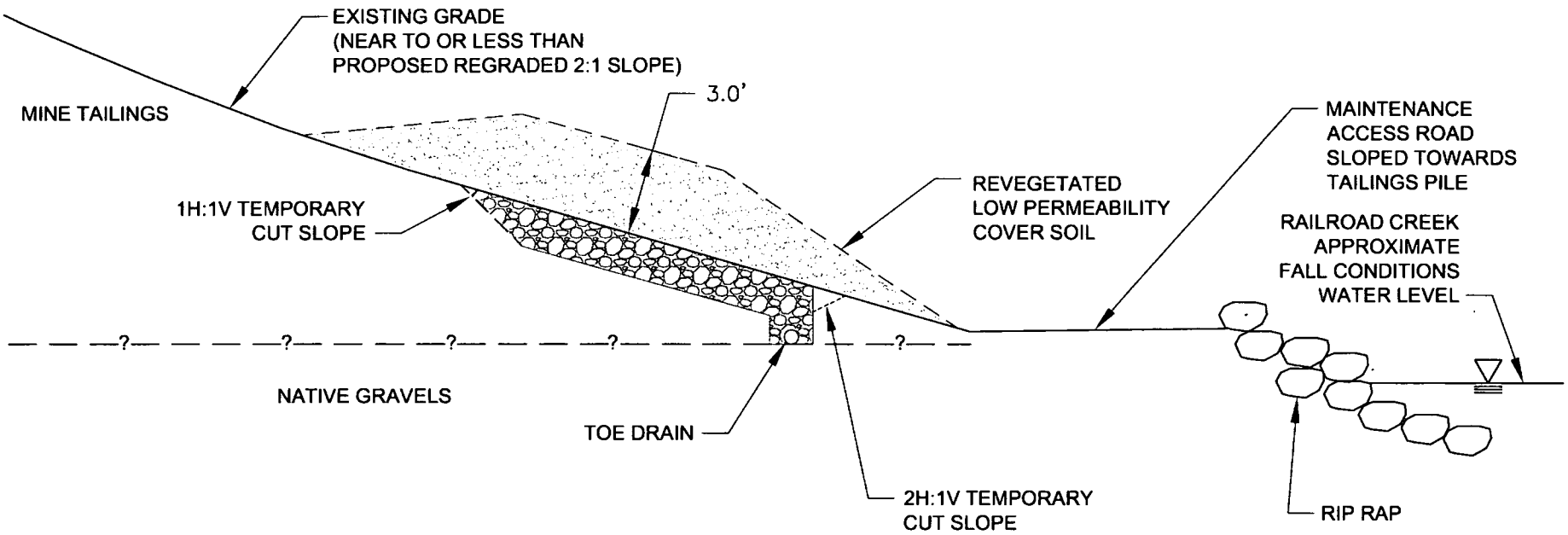

NOTES:

1. EXISTING GRADE IS APPROXIMATE.
2. CONTACT BETWEEN MINE TAILINGS AND NATIVE GRAVELS TO BE CONFIRMED PRIOR TO SYSTEM INSTALLATION.
3. SEE FIGURE 5 FOR DRAINAGE DETAILS.
4. LOW PERMEABILITY COVER SOIL MAY CONSIST OF COMPACTED FINE GRAINED MINE TAILINGS

SECTION A
SCALE: 1"= 5' 1

Figure 8

Conceptual Seeps SP-1 and 2 Interception System
Section A
Alternative 9
Holden Mine Site

FILENAME: Q:\geo\Holden Mine\SubTasks\Alt 9 memo\SP-1 Figure 5.dwg
EDIT DATE: 11/09/05 AT: 13:36

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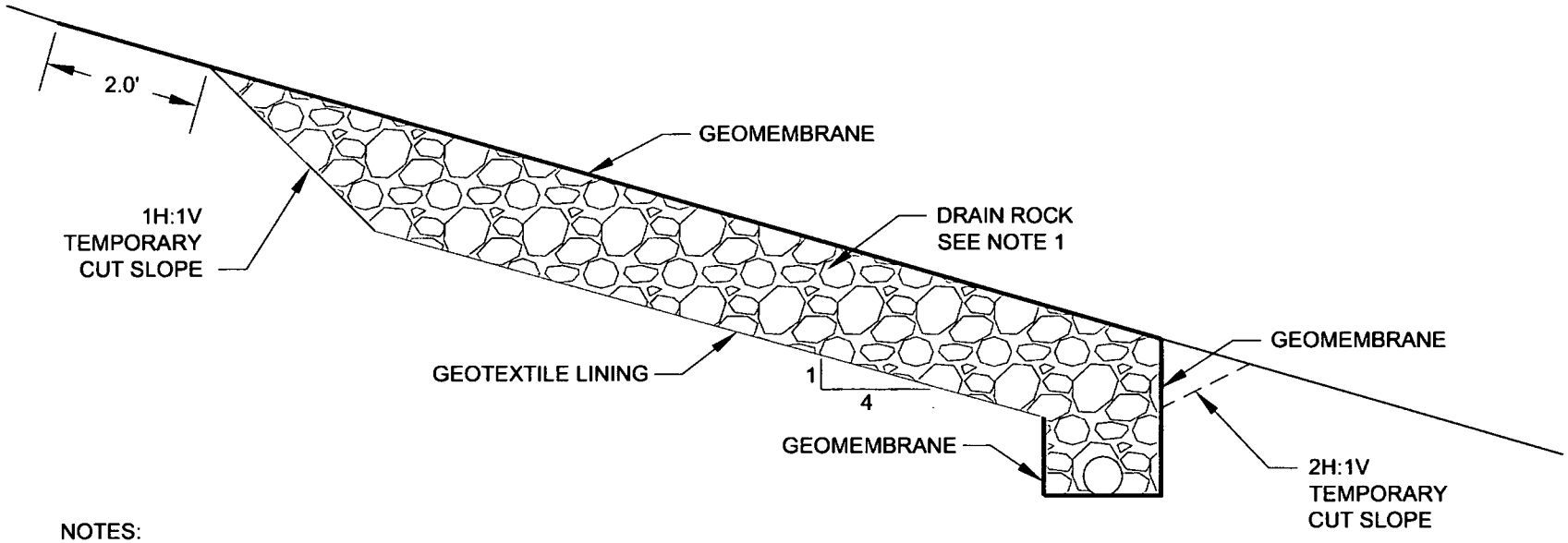

NOTES:

1. DRAIN ROCK SHALL BE ROUNDED GRAVEL CONFORMING TO THE WSDOT GRADATION FOR GRAVEL BACKFILL FOR DRYWELLS.

2. GEOMEMBRANE TO BE DETERMINED IN FINAL DESIGN

0 1 2
APPROXIMATE SCALE IN FEET

Figure 9

Conceptual Seeps SP-1 and 2
Interception System Drain Detail
Alternative 9
Holden Mine Site

FILENAME: Q:\geo\Holden Mine\SubTasks\Alt 9 memo\SP-1 Figure 9.dwg
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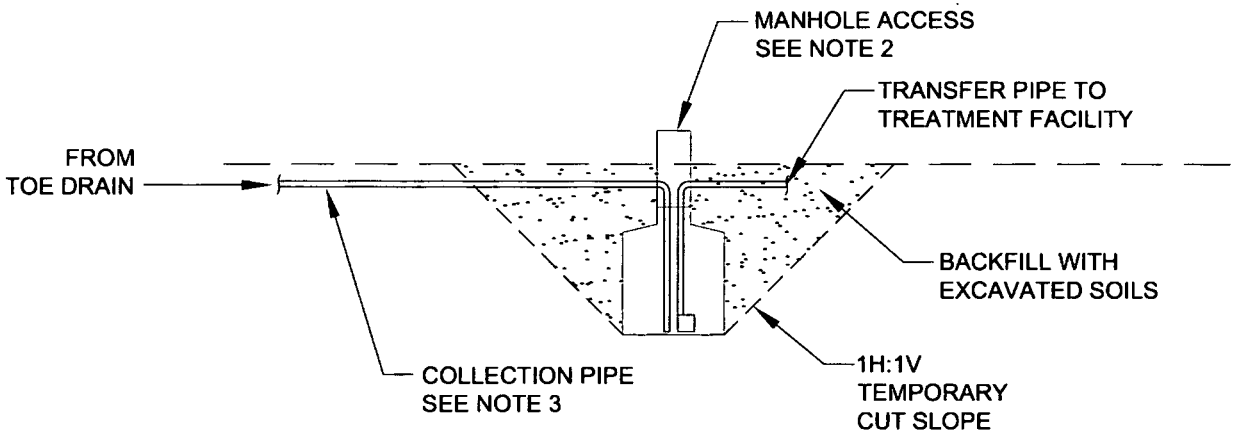

NOTES:

1. COLLECTION TANK DESIGNED FOR 2 HR HOLD TIME AT 12 GPM.
2. TOP MANHOLE ACCESS TO BE SET AT 20 YR FLOOD ELEVATION.
3. COLLECTION PIPE TO BE SET AT 2% SLOPE TOWARD COLLECTION TANK.

Figure 10

Conceptual Seeps SP-1 and 2 Interception System
Collection Tank Design
Alternative 9
Holden Mine Site

FILENAME: Q:\geo\Holden Mine\SubTasks\Alt 9 memo\SP-1 Figure 10.dwg
EDIT DATE: 11/09/05 AT: 13:46

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11/9/2005

Predicted Post-remediation Dissolved Cadmium Water Quality Criteria Ratios
Railroad Creek Downstream of RC-2

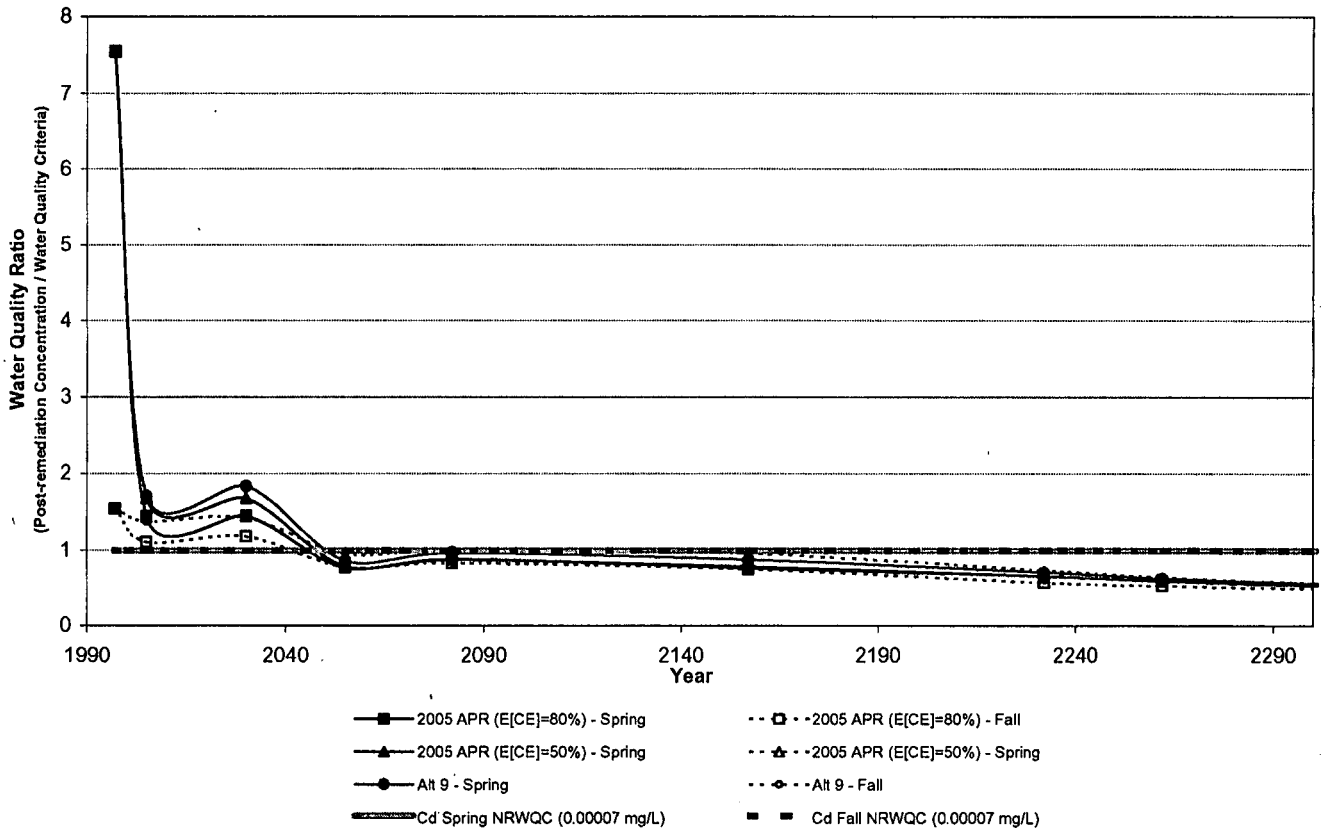

Figure 11
Predicted Post-remediation Dissolved Cadmium Water Quality Criteria Ratios
Holden Mine RI/FS

URS CORPORATION

Predicted Post-remediation Dissolved Copper Water Quality Criteria Ratios
Railroad Creek Downstream of RC-2

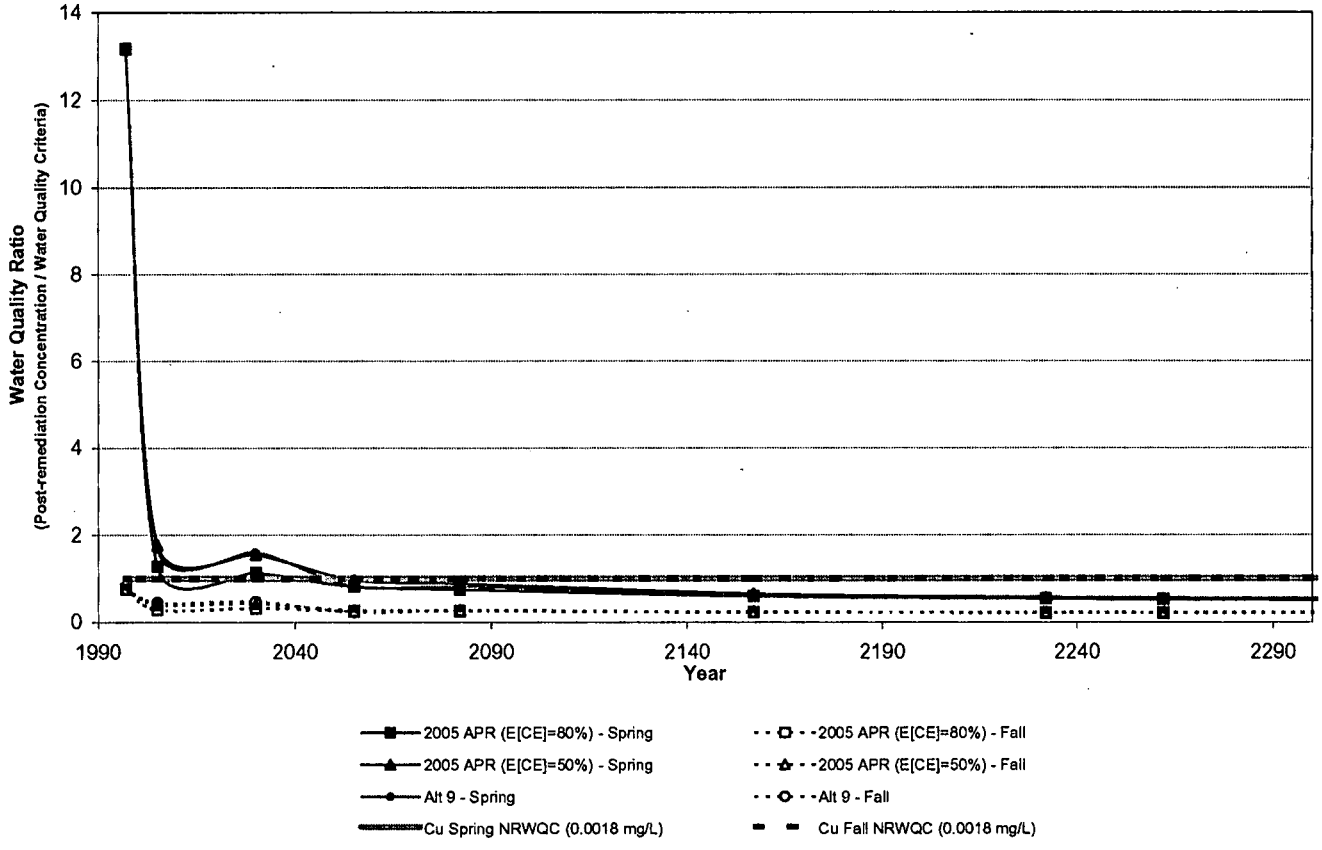

Figure 12
Predicted Post-remediation Dissolved Copper Water Quality Criteria Ratios
Holden Mine RI/FS

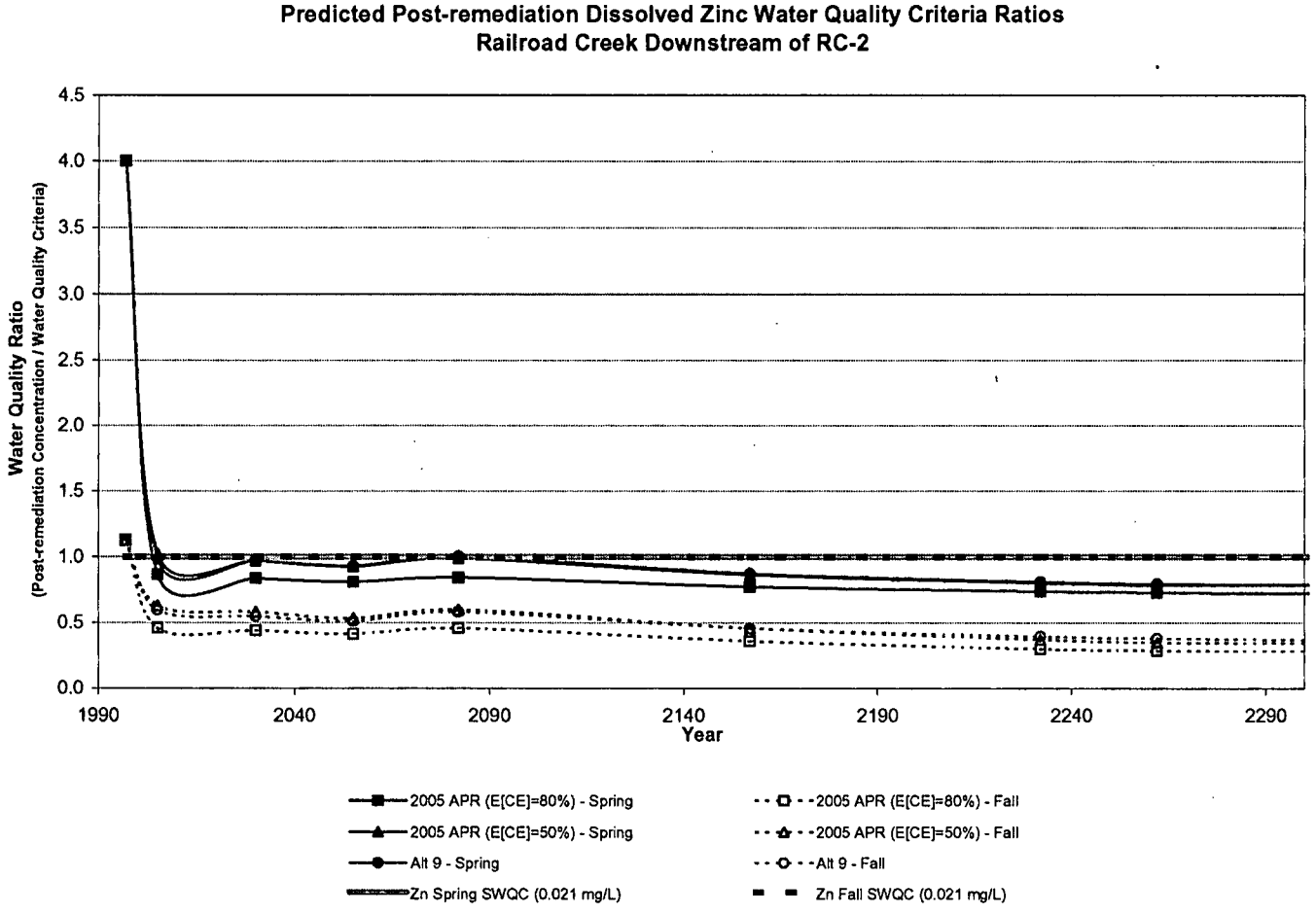

Figure 13
Predicted Post-remediation Dissolved Zinc Water Quality Criteria Ratios
Holden Mine RI/FS

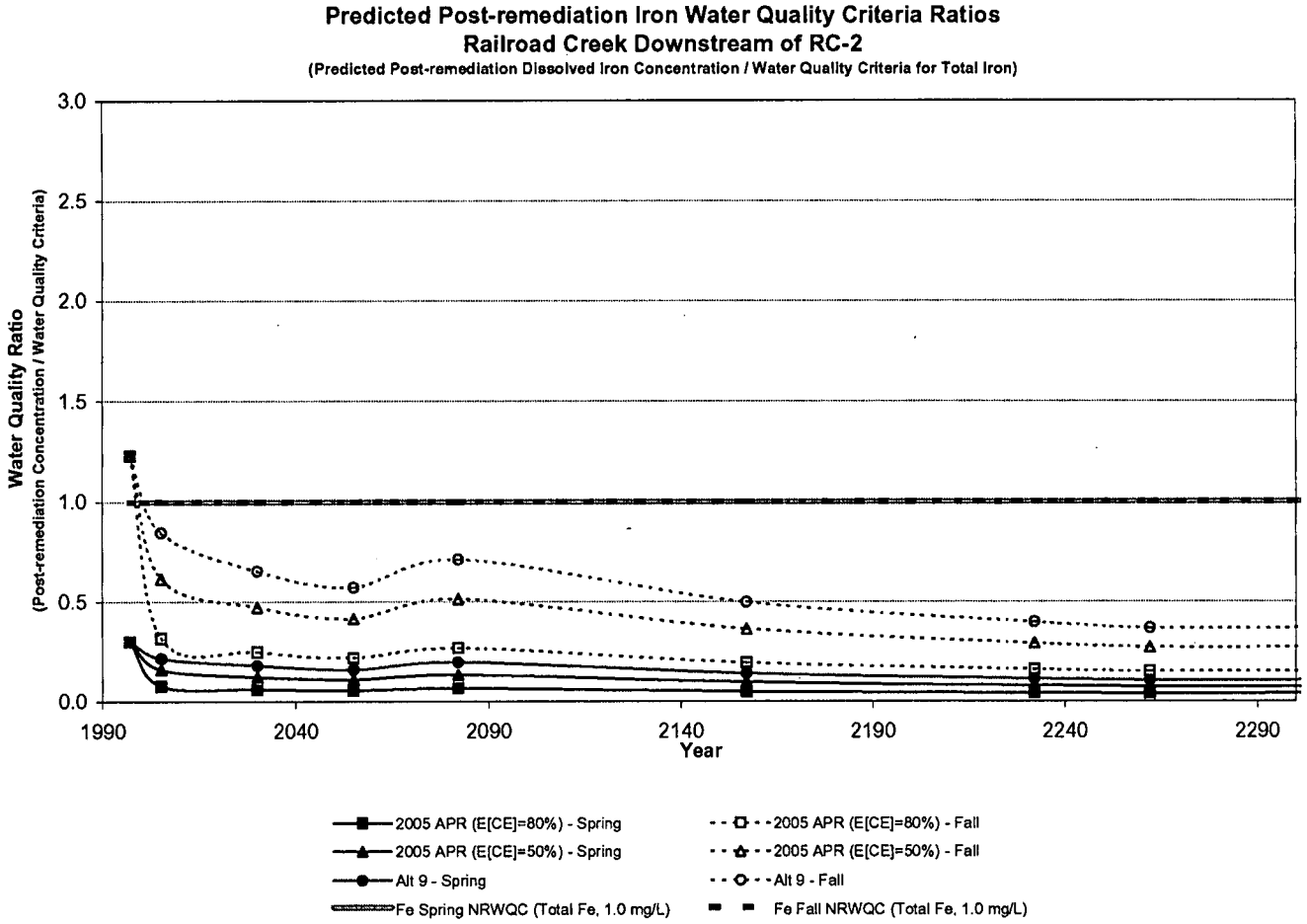

Figure 14
Predicted Post-remediation Iron Water Quality Criteria Ratios
Holden Mine RI/FS