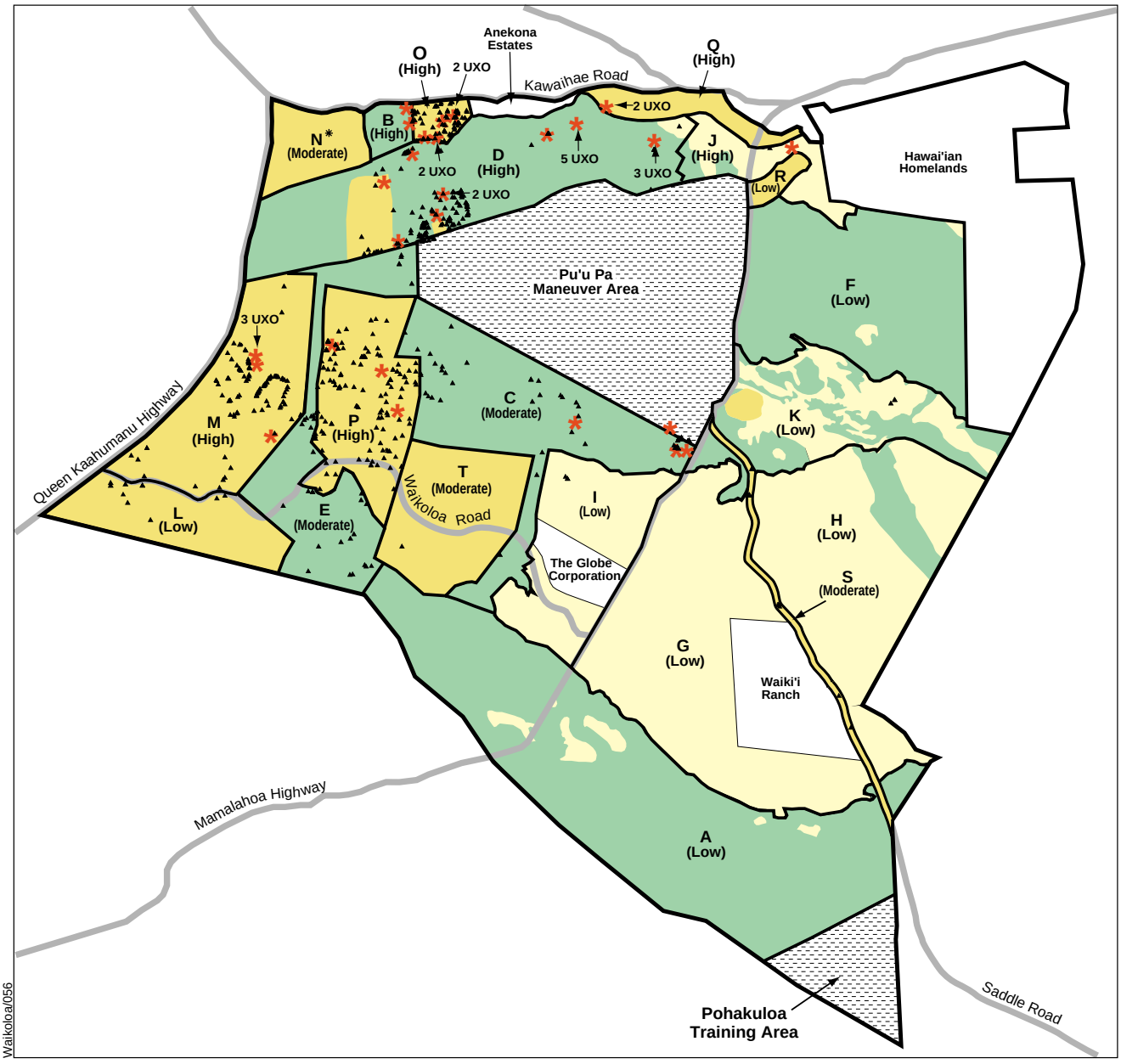
8.0 COMPARATIVE ANALYSIS OF OE RESPONSE ACTION ALTERNATIVES

This chapter describes the evaluation process for determining the most appropriate OE response action alternatives for the Former Waikoloa Maneuver Area and Nansay Sites. The evaluation criteria used to assess the alternatives are presented in Chapter 7.0. The results of the qualitative risk assessment in Chapter 4.0 and the comparative analysis of the four OE response action alternatives in this chapter form the basis for the recommendations made for the Former Waikoloa Maneuver Area and Nansay Sites, which are presented in Chapter 9.0, Recommended OE Response Action Alternatives.

Prior to conducting this comparative analysis of the four OE response action alternatives, the level of hazard that OE presents in each of the OERIA risk evaluation areas (Figure 8-1) was determined (Chapter 4.0) based on current and future land uses, results of the Phase II EE/CA field investigation Chapter 3.0), and previously documented reports of discovered OE. Using this information, and the three risk factors (OE Factors, Site Characteristics Factors, and Demographic Factors) evaluated in Chapter 4.0, the hazard level that OE presents to the public was qualitatively assessed. The OE hazard level for each OERIA evaluation area (Table 8-1) was used in this comparative analysis to help determine the most appropriate OE response action alternatives for the Former Waikoloa Maneuver Area and Nansay Sites.

This chapter analyzes the effectiveness, implementability, and cost of each OE response action alternative for the risk evaluation areas identified in Chapter 4.0 (see Figure 8-1). Effectiveness includes protection of human safety, compliance with ARARs, and both long- and short-term effectiveness. In terms of effectiveness, protection of human safety was evaluated first as a threshold criterion. Once the alternative met the threshold level, the evaluation was performed weighing all criteria equally. The equal weighing of criteria complies with the NCP provided that minimum threshold levels are met. Implementability includes technical and administrative feasibility, availability of services and materials, and both local agency and community acceptance. Local agency and community acceptance of the various alternatives was rated based on public meetings and interaction with local agencies and the community to date. Cost includes both the value of the investment and its corresponding benefit.

The OE hazard level determined in Chapter 4.0 for each of the 20 OERIA evaluation areas (see Table 8-1) was used as the basis for the effectiveness rankings throughout this comparative analysis of the four OE response action alternatives. For example, in an OERIA evaluation area with a “high” OE hazard level, NAI (Alternative 1) is considered an unacceptable OE response action alternative and it is not evaluated for that specific evaluation area. NAI would offer no risk reduction benefits in terms of protecting human safety in an area with a high OE hazard level. For an area with a “moderate” OE hazard level, NAI is evaluated as an acceptable OE response action alternative; however, NAI is ranked as the least acceptable of the four OE response action alternatives in



EXPLANATION

- Phase II EE/CA Boundary
- UXO recovered during Phase II EE/CA
- OE Scrap recovered during Phase II EE/CA
- **A** OERIA Evaluation Area
- **(Low)** OE Hazard Level (OERIA Results)

0 .75 1.5 3 Miles

- Group I (land uses consisting of open areas, conservation areas, and extensive agricultural lands)
- Group II (land uses consisting of agricultural districts, and intensive and other agricultural lands)
- Group III (land uses consisting of commercial areas, multiple residential areas and rural districts, industrial areas, and resort areas)
- Active military training areas not investigated during the EE/CA
- No right-of-entry areas not investigated during the EE/CA

*A 105mm projectile (UXO) was reportedly found near Area N during a previous investigation

Ordnance and Explosives Risk Impact Assessment (OERIA) Evaluation Areas and Results

Figure 8-1

Table 8-1. OERIA Evaluation Areas and Hazard Level Results

OERIA Evaluation Area	OERIA Hazard Level
Group I (open areas, conservation areas, extensive agricultural areas)	
Area A	Low
Area B	High
Area C	Moderate
Area D	High
Area E	Moderate
Area F	Low
Group II (agricultural districts)	
Area G	Low
Area H	Low
Area I	Low
Area J	High
Area K	Low
Group III (commercial, residential, industrial, rural, and resort areas)	
Area L	Low
Area M	High
Area N	Moderate
Area O	High
Area P	High
Area Q	High
Area R	Low
Area S	Moderate
Area T	Moderate

OERIA = Ordnance and Explosives Risk Impact Assessment

terms of protection of human safety and short-term and long-term effectiveness. For an area with a "low" OE hazard level, NAI is evaluated as an acceptable OE response action alternative and is ranked accordingly in terms of its effectiveness.

The 20 OERIA evaluation areas were evaluated using this comparative analysis of the four OE response actions to help identify the best OE response action alternative(s) to render the areas compatible with their intended disposition. Alternatives were ranked in numerical order, with "1" being the best alternative for that criterion. The alternative with the lowest ranking score is considered the best in terms of these evaluation criteria.

Institutional Controls, although evaluated as a separate OE response action alternative in this comparative analysis, may be recommended in conjunction with a surface and/or subsurface clearance action or may be recommended as a site-wide OE response action.

8.1 GROUP I LAND USE

8.1.1 Area A

The overall OE hazard level in this area is low (see Figure 8-1), based on the results of the Phase II EE/CA field investigation and evaluation of the three risk factors (i.e., OE Type, Site Characteristics, Site Demographics) defined in the qualitative risk assessment (Chapter 4.0). Using this information, the four OE response action alternatives evaluated in this EE/CA report are comparatively analyzed in the following subsections to determine the most appropriate OE response action alternative for Area A.

8.1.1.1 Effectiveness.

Table 8-2 provides the effectiveness criteria of the four alternatives for Area A. The evaluation of each of these alternatives is presented below.

Table 8-2. Effectiveness Criteria Evaluation for Area A

	Effectiveness					
Alternative	Protection of Human Safety	Compliance with ARARs	Long Term	Short Term	Score	Rank
1, No Action Indicated (NAI)	4	1	4	1	10	3
2, Institutional Controls	1	1	1	2	5	1
3, Surface Clearance	2	1	2	3	8	2
4, Subsurface Clearance to Depth	3	1	3	4	11	4

Note: Ranking from best to worst; best = 1.
ARAR = applicable or relevant and appropriate requirement

Protection of Human Safety. Although the OE hazard level in this area is low, there will always be a residual risk associated with OE at the former maneuver area based on past military use of the site; therefore, institutional controls, because of its ability to educate the public concerning the risk associated with OE, is ranked 1 (best) for protection of human safety. Because the OE hazard level in this area is low, there is essentially little to be gained with regard to protection of human safety by performing a surface clearance or subsurface clearance to depth of detection in this area; therefore, the surface clearance is ranked 2 (second best) and the subsurface clearance to depth of detection is ranked 3 (third best). NAI is ranked 4 (last) because it would do nothing to protect human safety, even in an area with only a residual risk.

Compliance with ARARs. Compliance with ARARs has been ranked equally among Alternatives 1 through 4, as full compliance with the ARARs is expected with minimal impact to the environment.

Long-term Effectiveness. Institutional controls, in an area with a low OE hazard level, would be the most effective alternative over the long term because it would educate and inform the public concerning the residual risk associated with OE in this area. Because the OE hazard level in this area is low, there is

essentially little to be gained in terms of effectiveness over the long term by performing a surface clearance or subsurface clearance to depth of detection; therefore, the surface clearance is ranked 2 (second best) and the subsurface clearance to depth of detection is ranked 3 (third best). NAI is ranked 4 (last) because it would not be an effective risk reduction measure over the long term.

Short-term Effectiveness. Since the OE hazard level in this area is low, NAI would be the most effective alternative over the short term. Institutional controls is ranked 2 (second best) for short-term effectiveness because it would require an extended effort and additional time to coordinate with landowners and local agencies for implementation. The level of short-term effectiveness gained from a surface clearance or subsurface clearance to depth of detection is relatively lower than the effectiveness of NAI or institutional controls because the OE hazard level is already low; therefore, surface clearance is ranked 3 (third best) and subsurface clearance to depth of detection is ranked 4 (last).

8.1.1.2 Overall Effectiveness Ranking for Alternatives 1 through 4.

Institutional Controls (Alternative 2) is ranked as the most effective OE response action alternative because the OE hazard level is this area is already low. Surface Clearance of OE (Alternative 3) is ranked 2 (second best) and NAI (Alternative 1) is ranked 3 (third best). Because the OE hazard level in this area is already low, there would be minimal effectiveness in performing a subsurface clearance to depth of detection; therefore, Subsurface Clearance of OE to Depth of Detection (Alternative 4) is ranked 4 (last) in terms of effectiveness.

8.1.1.3 Implementability.

Table 8-3 provides the implementability criteria of the four alternatives for Area A. The evaluation of each alternative is presented below.

Table 8-3. Implementability Criteria Evaluation for Area A

	Implementability						
Alternative	Technical Feasibility	Administrative Feasibility	Services and Materials	Local Agency Acceptance	Community Acceptance	Score	Rank
1, No Action Indicated (NAI)	1	1	1	2	4	9	1
2, Institutional Controls	4	4	2	1	1	12	2
3, Surface Clearance	2	2	3	3	2	12	2
4, Subsurface Clearance to Depth	3	3	4	4	3	17	4

Note: Ranking from best to worst; best = 1.

Technical and Administrative Feasibility. Implementing the NAI alternative would be easier than implementing any of the other alternatives, from both an administrative and a technical feasibility perspective, as no effort, materials, or services would be required. Therefore, NAI is ranked 1 (best) for technical and administrative feasibility.

Implementing institutional controls would require more logistical and management support than a clearance action because the process must be conducted in close coordination with local agencies, landowners, and the community. Although the supplies and personnel needed to construct display cases, install warning signs, conduct educational programs, and implement and oversee use restrictions are readily available, the length of time necessary to identify landowners and coordinate the implementation of institutional controls with landowners would be much greater than the relatively short length of time required to implement a clearance action. Therefore, institutional controls is ranked 4 (last) from a technical and administrative feasibility standpoint.

Implementation of a surface clearance would be quite feasible from a technical and administrative perspective. While relatively easier to implement than institutional controls or the subsurface clearance to depth of detection, the surface clearance would require more effort to implement than NAI (which requires no effort). Therefore, surface clearance is ranked 2 (second best) for technical and administrative feasibility.

From technical and administrative perspectives, implementation of a subsurface clearance to depth of detection is quite feasible. This alternative generally requires less logistical and management support than institutional controls, but requires more logistical and management support than a surface clearance or NAI. Unlike a surface clearance, a subsurface clearance to depth of detection requires excavation equipment (in addition to specially trained and qualified personnel and a means of OE disposal, which is required for all clearance actions). Therefore, subsurface clearance to depth of detection is ranked 3 (third best) in terms of technical and administrative feasibility, as it would take more time and effort to implement than a surface clearance or NAI, but less time and effort to implement than institutional controls.

Services and Materials. NAI is ranked 1 (best) for services and materials, as no effort, materials, or services would be required. Institutional controls is ranked 2 (second best) because the supplies and personnel needed to construct display cases, install warning signs, conduct educational programs, and implement and oversee use restrictions are readily available. Surface clearance is ranked 3 (third best) because it would require specially trained and qualified personnel as well as the means of disposing of any encountered OE. Unlike a surface clearance, implementation of a subsurface clearance to depth of detection requires excavation equipment (in addition to specially trained and qualified personnel and a means of OE disposal). Therefore, subsurface clearance to depth of detection is ranked 4 (last) for availability of services and materials.

Local Agency Acceptance. Based on interaction with agency representatives to date, it has been determined that local agencies are likely to consider institutional controls as the most acceptable alternative in this area, based on the low OE hazard level and the land use in Area A; therefore, institutional controls is ranked 1 (best) in terms of local agency acceptance. Local agencies would be more likely to consider NAI as an acceptable alternative over a surface clearance or subsurface clearance to depth of detection due to the low OE hazard level in this area and that there are no plans for future development.

Community Acceptance. Based on interaction with the community during the EE/CA investigation and during RAB meetings, the community is likely to consider institutional controls as the most acceptable alternative in this area based on the low OE hazard level in this area; therefore, institutional controls is ranked 1 (best) in terms of community acceptance. The community is more likely to consider a surface clearance or a subsurface clearance to depth of detection over NAI because there will always be a residual risk (no matter how small) associated with OE in this area (given past military use of the land). Therefore, the surface clearance is ranked 2 (second best) and the subsurface clearance to depth of detection is ranked 3 (third best). NAI is ranked 4 (last) in terms of community acceptance.

8.1.1.4 Overall Implementability Ranking for Alternatives 1 through 4.

NAI (Alternative 1) is ranked as the best overall OE response action alternative in terms of implementability for Area A (see Table 8-3), based upon the low OE hazard level in this area. Institutional Controls (Alternative 2) and Surface Clearance of OE (Alternative 3) are tied as the second best OE response action alternative in terms of implementability. Subsurface Clearance of OE to Depth of Detection (Alternative 4) is ranked 4 (last), based on implementability issues and that the OE hazard level in this area is already low.

8.1.1.5 Cost.

Table 8-4 provides the cost criteria of the four alternatives for Area A. The evaluation of each of these alternatives is presented below.

Table 8-4. Cost Criteria Evaluation for Area A

Alternative	Cost	Investment	Benefit	Score	Rank
1, No Action Indicated (NAI)	$0	1	2	3	1
2, Institutional Controls	$2,774,516	2	1	3	1
3, Surface Clearance	$17,300,230	3	3	6	3
4, Subsurface Clearance to Depth	$177,784,052	4	4	8	4

Note: Ranking from best to worst; best = 1.

Investment and Benefit. There is no cost associated with NAI; therefore, NAI is ranked 1 (best) in terms of investment. The alternative that provides the greatest benefit, in terms of dollars spent to effect results, appears to be institutional controls. Although the OE hazard level in this area is low, it would be beneficial to inform and educate the public concerning the dangers associated with ordnance. Because the OE hazard level is already low, there would be minimal (if any) risk reduction benefits that could be gained by performing a surface clearance or a subsurface clearance to depth of detection.

8.1.1.6 Overall Cost Ranking for Alternatives 1 through 4.

NAI (Alternative 1) and Institutional Controls (Alternative 2) both ranked as the best overall alternative in terms of cost for Area A. The OE hazard level in this

area is already low; therefore, NAI (Alternative 1) and Institutional Controls (Alternative 2) tied as the most cost-effective alternatives. Because the OE hazard level in this area is already low, very little benefit would be gained by implementing the Surface Clearance of OE (Alternative 3) or the Subsurface Clearance of OE to Depth of Detection (Alternative 4).

8.1.1.7 Overall Ranking of Alternatives for Area A.

The overall ranking of the different alternatives in terms of their effectiveness, implementability, and cost is presented in Table 8-5. The alternative with the lowest score is considered best for each criterion (effectiveness, implementability, and cost) evaluated.

Table 8-5. Alternative Evaluation for Area A

Alternative	Effectiveness Rank	Implementability Rank	Cost Rank	Overall Score	Overall Rank
1, No Action Indicated (NAI)	3	1	1	5	2
2, Institutional Controls	1	2	1	4	1
3, Surface Clearance	2	2	3	7	3
4, Subsurface Clearance to Depth	4	4	4	12	4

Note: Ranking from best to worst; best = 1.

Because the OE hazard level in Area A is low and there are no plans for future development, Institutional Controls (Alternative 2) is ranked as the best overall OE response action alternative. NAI (Alternative 1) ranked as the second best alternative in this area. Very little would be gained by conducting extensive risk reduction efforts in an area where the OE hazard level is already low; therefore, Surface Clearance of OE (Alternative 3) is ranked 3 (third best) and the Subsurface Clearance of OE to Depth of Detection (Alternative 4) is ranked 4 (last). Specific recommendations for Area A are made in Chapter 9.0, Recommended OE Response Action Alternatives.

8.1.2 Area B

The overall OE hazard level in this area is high (see Figure 8-1), based on the results of the Phase II EE/CA field investigation and evaluation of the three risk factors (OE Type, Site Characteristics, and Site Demographics) defined in the qualitative risk assessment (Chapter 4.0). Using this information, the four OE response action alternatives evaluated in this EE/CA report are comparatively analyzed in the following subsections to determine the most appropriate OE response action alternatives for Area B.

8.1.2.1 Effectiveness.

Table 8-6 provides the effectiveness criteria of the four alternatives for Area B. The evaluation of each of these alternatives is presented below.

Table 8-6. Effectiveness Criteria Evaluation for Area B

Alternative	Effectiveness: Protection of Human Safety	Effectiveness: Compliance with ARARs	Effectiveness: Long Term	Effectiveness: Short Term	Score	Rank
1, No Action Indicated (NAI)	NA	NC	NC	NC	NC	NC
2, Institutional Controls	3	1	3	3	10	3
3, Surface Clearance	2	1	2	1	6	2
4, Subsurface Clearance to Depth	1	1	1	2	5	1

Note: Ranking from best to worst; best = 1.
ARAR = applicable or relevant and appropriate requirement
NA = not applicable
NC = not considered

Protection of Human Safety. NAI is considered an unacceptable OE response action alternative for Area B because it does not meet the minimum threshold criterion for the protection of human safety; therefore, NAI is not evaluated further as an acceptable OE response action alternative for Area B. Institutional controls is ranked 3 (third best) for protection of human safety because it does not involve the removal of OE and is therefore less protective of human safety in an area with a high OE hazard level than the surface clearance or the subsurface clearance to depth of detection. Surface clearance is ranked 2 (second best) and subsurface clearance to depth of detection is ranked 1 (best) for protection of human safety, based upon their ability to provide the greatest reduction in risk associated with the high OE hazard level in this area.

Compliance with ARARs. Compliance with ARARs has been ranked equally among Alternatives 2 through 4, as full compliance with the ARARs is expected with minimal impact to the environment.

Long-term Effectiveness. Institutional controls is ranked 3 (last) because it would not be effective over the long term in reducing the risk associated with the high OE hazard level in Area B. Surface clearance is ranked 2 (second best) as it would be more effective over the long term than institutional controls, but less effective over the long term than a subsurface clearance to depth of detection. Subsurface clearance to depth of detection is ranked 1 (best) because it would provide the maximum protection of human safety and would be the most effective OE response action alternative over the long term.

Short-term Effectiveness. Institutional controls is ranked 3 (last) for short-term effectiveness because of the length of time necessary to implement the alternative to the point that it affords protection. The time involved includes identifying landowners and responsible agencies, meeting with landowners and local agencies to confirm the location of display cases and warning signs, and coordination of the distribution of informational pamphlets and establishment of local community awareness meetings. Surface clearance is ranked 1 (best) for short term effectiveness, as it would take less time to implement and would be more effective over the short term than institutional controls or a subsurface clearance to depth of detection. Subsurface clearance to depth of detection is ranked 2 (second best) for short-term effectiveness, as it would take significantly more time to implement than a surface clearance, but less time to implement than institutional controls.

8.1.2.2 Overall Effectiveness Ranking for Alternatives 1 through 4.

Subsurface Clearance of OE to Depth of Detection (Alternative 4) is ranked as the best overall alternative in terms of effectiveness for Area B (see Table 8-6), based upon its ability to reduce the risk associated with the high OE hazard level in this area and because it provides the most effective protection to the public from OE. Surface Clearance of OE (Alternative 3) is ranked 2 (second best) because it would not offer the most effective protection to the public and would not be the most effective OE response action alternative over the long term. Institutional Controls (Alternative 2) is ranked 3 (last) because it would take too much time to coordinate with landowners and local agencies and would not be as effective as a clearance action in an area with a high OE hazard level.

8.1.2.3 Implementability.

Table 8-7 provides the implementability criteria of the four alternatives for Area B. The evaluation of each of these alternatives is presented below.

Table 8-7. Implementability Criteria Evaluation for Area B

	Implementability						
Alternative	Technical Feasibility	Administrative Feasibility	Services and Materials	Local Agency Acceptance	Community Acceptance	Score	Rank
2, Institutional Controls	3	3	1	3	3	13	3
3, Surface Clearance	1	1	2	2	2	8	1
4, Subsurface Clearance to Depth	2	2	3	1	1	9	2

Note: Ranking from best to worst; best = 1.

Technical and Administrative Feasibility. Implementing the institutional controls alternative would require more logistical and management support than a clearance action because the process must be conducted in close coordination with local agencies and the community. Although the supplies and personnel needed to construct display cases, install warning signs, conduct educational programs, and implement and oversee use restrictions are readily available, the length of time necessary to identify landowners, coordinate the implementation of institutional controls with landowners, and implement institutional controls would be much greater than the relatively short length of time required to implement a clearance action. Therefore, institutional controls is ranked 3 (last) from a technical and administrative feasibility standpoint.

Implementation of a surface clearance would be quite feasible from a technical and administrative perspective. The surface clearance would be relatively easier to implement than institutional controls or the subsurface clearance to depth of detection. Therefore, surface clearance is ranked 1 (best) for technical and administrative feasibility.

From technical and administrative perspectives, implementation of a subsurface clearance to depth of detection is quite feasible. This alternative generally requires less logistical and management support than institutional controls, but

requires more logistical and management support than a surface clearance. Unlike a surface clearance, a subsurface clearance to depth of detection requires excavation equipment (in addition to specially trained and qualified personnel and a means of OE disposal, which is required for all clearance actions). Therefore, the subsurface clearance to depth of detection is ranked 2 (second best) in terms of technical and administrative feasibility, as it would take more time and effort to implement than the surface clearance, but less time and effort to implement than institutional controls.

Services and Materials. Institutional controls is ranked 1 (best) because the supplies and personnel needed to construct and install display cases and warning signs, conduct educational programs, and implement and oversee use restrictions are readily available. Surface clearance is ranked 2 (second best) because it would require specially trained and qualified personnel as well as the means of disposing of any encountered OE. Unlike a surface clearance, implementation of a subsurface clearance to depth of detection requires excavation equipment (in addition to specially trained and qualified personnel and a means of OE disposal). Therefore, this alternative ranked 3 (last) for availability of services and materials.

Local Agency Acceptance. Based on interaction with agency representatives to date, it has been determined that local agencies are likely to consider the subsurface clearance to depth of detection as the most appropriate and acceptable alternative for Area B, based on the high OE hazard level and that the area is easily accessible to the public. Surface clearance is ranked 2 (second best) and institutional controls is ranked 3 (last).

Community Acceptance. Based on interaction with the community during the EE/CA investigation and during RAB meetings, the community is likely to consider the subsurface clearance to depth of detection as the most appropriate and acceptable alternative for Area B, based on the high OE hazard level and that the area is easily accessible by the local community. Surface clearance, because it would only remove OE (if present) from the surface, is ranked 2 (second best). Institutional controls alone would not reduce the OE hazard level in this area and would not be an effective alternative unless it is implemented in conjunction with a clearance action; therefore, institutional controls is ranked 3 (last) for Area B.

8.1.2.4 Overall Implementability Ranking for Alternatives 1 through 4.

Surface Clearance of OE (Alternative 3) is ranked as the best overall alternative in terms of implementability for Area B (see Table 8-7) due to the high OE hazard level and that the area is easily accessible by the local community. Subsurface Clearance of OE to Depth of Detection (Alternative 4) is ranked 2 (second best), based on implementability issues. Institutional Controls (Alternative 2) is ranked 3 (last) because it would not be considered as an acceptable stand-alone alternative to local agencies and the community, as it does not involve the removal of OE.

8.1.2.5 Cost.

Table 8-8 provides the cost criteria of the four alternatives for Area B. The evaluation of each of these alternatives is presented below.

Table 8-8. Cost Criteria Evaluation for Area B

Alternative	Cost	Investment	Benefit	Score	Rank
2, Institutional Controls	$91,239	1	3	4	2
3, Surface Clearance	$922,640	2	1	3	1
4, Subsurface Clearance to Depth	$6,307,028	3	2	5	3

Note: Ranking from best to worst; best = 1.

Investment and Benefit. There are minimal costs associated with institutional controls; therefore, institutional controls is ranked 1 (best) in terms of investment. The alternative that provides the greatest benefit, in terms of dollars spent to effect results, appears to be the surface clearance, followed by the subsurface clearance to depth of detection and institutional controls. The cost of implementing institutional controls is lower than that of any clearance alternative; however, the benefit of implementation in protecting human safety in an area with a high OE hazard level would be much lower than the benefit of either the surface or subsurface clearance actions.

8.1.2.6 Overall Cost Ranking for Alternatives 1 through 4.

Surface Clearance of OE (Alternative 3) is ranked as the best OE response action alternative in terms of cost for Area B (see Table 8-8), based upon its ability to reduce the OE hazard level and potential for exposure to OE in this area for dollars spent to effect results. Institutional Controls (Alternative 2) is ranked 2 (second best) because it has the ability to reduce the OE hazard level in this area, and the benefit of implementation could be similar to that of a surface clearance, depending on local agency and community support and involvement. The Subsurface Clearance of OE to Depth of Detection (Alternative 4) is ranked 3 (last) based on cost.

8.1.2.7 Overall Ranking of Alternatives for Area B.

The overall ranking of the different alternatives in terms of their effectiveness, implementability, and cost is presented in Table 8-9. The alternative with the lowest score is considered best for each criterion (effectiveness, implementability, and cost) evaluated.

Table 8-9. Alternative Evaluation for Area B

Alternative	Effectiveness Rank	Implementability Rank	Cost Rank	Overall Score	Overall Rank
2, Institutional Controls	3	3	2	8	3
3, Surface Clearance	2	1	1	4	1
4, Subsurface Clearance to Depth	1	2	3	6	2

Note: Ranking from best to worst; best = 1.

Surface Clearance of OE (Alternative 3) is ranked as the best overall OE response action alternative for Area B due to the high OE hazard level and that the area is accessible to the local communities. Subsurface Clearance of OE to Depth of Detection (Alternative 4) is ranked 2 (second best), based on cost and implementability issues. Institutional Controls (Alternative 2) is ranked 3 (last) because it would not involve the removal of OE and is considered an unacceptable stand-alone alternative to local agencies and the community. Specific recommendations for Area B are made in Chapter 9.0, Recommended OE Response Action Alternatives.

8.1.3 Area C

The overall OE hazard level in this area is moderate (see Figure 8-1), based on the results of the Phase II EE/CA field investigation and evaluation of the three risk factors (OE Type, Site Characteristics, and Site Demographics) defined in the qualitative risk assessment (Chapter 4.0). Using this information, the four OE response action alternatives evaluated in this EE/CA report are comparatively analyzed in the following subsections to determine the most appropriate OE response action alternative for Area C.

8.1.3.1 Effectiveness.

Table 8-10 provides the effectiveness criteria of the four alternatives for Area C. The evaluation of each of these alternatives is presented below.

Table 8-10. Effectiveness Criteria Evaluation for Area C

	Effectiveness					
Alternative	Protection of Human Safety	Compliance with ARARs	Long Term	Short Term	Score	Rank
1, No Action Indicated (NAI)	4	1	4	4	13	4
2, Institutional Controls	3	1	3	3	10	3
3, Surface Clearance	2	1	2	1	6	2
4, Subsurface Clearance to Depth	1	1	1	2	5	1

Note: Ranking from best to worst; best = 1.
ARAR = applicable or relevant and appropriate requirement

Protection of Human Safety. If the NAI alternative were implemented, the potential for exposure to OE would remain unchanged; therefore, NAI is ranked 4 (last) for protection of human safety. Institutional controls is ranked 3 (third best) for protection of human safety because it would not involve the removal of ordnance in an area with a moderate OE hazard level and would, therefore, not be the most effective in protecting human safety. Surface clearance would reduce the potential for exposure to OE in this area; therefore, surface clearance is ranked 2 (second best) in terms of protection of human safety. Subsurface clearance to depth of detection is ranked 1 (best) because it would offer the greatest reduction in exposure to OE and provide the maximum protection of human safety in an area with a moderate OE hazard level.

Compliance with ARARs. Compliance with ARARs has been ranked equally among Alternatives 1 through 4, as full compliance with the ARARs is expected with minimal impact to the environment.

Long-term Effectiveness. NAI is ranked 4 (last) in terms of long-term effectiveness because it would offer no reduction in risk over the long term. Institutional controls is ranked 3 (third best) because it would not be effective over the long term in reducing the risk associated with the moderate OE hazard level in Area C. Surface clearance is ranked 2 (second best), as it would be more effective over the long term than institutional controls, but less effective over the long term than a subsurface clearance to depth of detection. Subsurface clearance to depth of detection is ranked 1 (best) because it would provide the maximum protection of human safety and would be the most effective OE response action alternative over the long term.

Short-term Effectiveness. NAI is ranked 4 (last) in terms of short-term effectiveness because it would offer no reduction in risk over the short term. Institutional controls is ranked 3 (third best) for short-term effectiveness because of the length of time necessary to implement the alternative to the point that it affords protection. The time involved with implementation of institutional controls includes identifying landowners and responsible agencies, meeting with landowners and local agencies to confirm the location of display cases and warning signs, and coordination of the distribution of informational pamphlets and establishment of local community awareness meetings. Surface clearance is ranked 1 (best) for short-term effectiveness, as it would take less time to implement and would be more effective over the short term than institutional controls or a subsurface clearance to depth of detection. Subsurface clearance to depth of detection is ranked 2 (second best) for short-term effectiveness, as it would take significantly more time to implement than a surface clearance, but less time to implement than institutional controls.

8.1.3.2 Overall Effectiveness Ranking for Alternatives 1 through 4.

Subsurface Clearance of OE to Depth of Detection (Alternative 4) is ranked as the best OE response action alternative in terms of effectiveness for Area C (see Table 8-10), based upon its ability to reduce the potential risk of OE exposure and provide the most effective protection to the public from OE. Surface Clearance of OE (Alternative 3) is ranked 2 (second best) and Institutional Controls (Alternative 2) is ranked 3 (third best) because both would offer less protection to the public in an area with a moderate OE hazard level than the Subsurface Clearance of OE to Depth of Detection (Alternative 4). NAI (Alternative 1) ranked 4 (last) because it would do nothing to protect human safety.

8.1.3.3 Implementability.

Table 8-11 provides the implementability criteria of the four alternatives for Area C. The evaluation of each of these alternatives is presented below.

Table 8-11. Implementability Criteria Evaluation for Area C

Alternative	Implementability					Score	Rank
	Technical Feasibility	Administrative Feasibility	Services and Materials	Local Agency Acceptance	Community Acceptance		
1, No Action Indicated (NAI)	1	1	1	4	4	11	2
2, Institutional Controls	4	4	2	3	3	16	4
3, Surface Clearance	2	2	3	1	1	9	1
4, Subsurface Clearance to Depth	3	3	4	2	2	14	3

Note: Ranking from best to worst; best = 1.

Technical and Administrative Feasibility. Implementing the NAI alternative would be easier than implementing any of the other alternatives, from both an administrative and a technical feasibility perspective, as no effort, materials, or services would be required. Therefore, NAI is ranked 1 (best) for technical and administrative feasibility.

Implementing institutional controls would require more logistical and management support than a clearance action because the process must be conducted in close coordination with local agencies, landowners, and the community. Although the supplies and personnel needed to construct display cases, install warning signs, conduct educational programs, and implement and oversee use restrictions are readily available, the length of time necessary to identify landowners and coordinate the implementation of institutional controls with landowners would be much greater than the relatively short length of time required to implement a clearance action. Therefore, institutional controls is ranked 4 (last) from a technical and administrative feasibility standpoint.

Implementation of a surface clearance would be quite feasible from a technical and administrative perspective. While relatively easier to implement than institutional controls or the subsurface clearance to depth of detection, the surface clearance would require more effort to implement than NAI (which requires no effort). Therefore, surface clearance is ranked 2 (second best) for technical and administrative feasibility.

From technical and administrative perspectives, implementation of a subsurface clearance to depth of detection is quite feasible. This alternative generally requires less logistical and management support than institutional controls, but requires more logistical and management support than a surface clearance or NAI. Unlike a surface clearance, a subsurface clearance to depth of detection requires excavation equipment (in addition to specially trained and qualified personnel and a means of OE disposal, which is required for all clearance actions). Therefore, subsurface clearance to depth of detection is ranked 3 (third best) in terms of technical and administrative feasibility, as it would take more time and effort to implement than a surface clearance or NAI, but less time and effort to implement than institutional controls.

Services and Materials. NAI is ranked 1 (best) for services and materials, as no effort, materials, or services would be required. Institutional controls is ranked 2 (second best) because the supplies and personnel needed to construct display

cases, install warning signs, conduct educational programs, and implement and oversee use restrictions are readily available. Surface clearance is ranked 3 (third best) because it would require specially trained and qualified personnel as well as the means of disposing of any encountered OE. Unlike a surface clearance, implementation of a subsurface clearance to depth of detection requires excavation equipment (in addition to specially trained and qualified personnel and a means of OE disposal, which is required for all clearance actions). Therefore, subsurface clearance to depth of detection is ranked 4 (last) for availability of services and materials.

Local Agency Acceptance. Based on interaction with agency representatives to date, it has been determined that local agencies are likely to consider a surface clearance as the most acceptable alternative, based on the moderate OE hazard level in Area C; therefore, surface clearance is ranked 1 (best) in terms of local agency acceptance. Local agencies would be more likely to consider a subsurface clearance to depth of detection in Area C over institutional controls or NAI, due to the UXO item that was found subsurface in this area during the Phase II EE/CA field investigation; therefore, subsurface clearance to depth of detection is ranked 2 (second best), institutional controls is ranked 3 (third best), and NAI is ranked 4 (last).

Community Acceptance. Based on interaction with the community during the EE/CA investigation and during RAB meetings, the community is likely to consider a surface clearance as the most acceptable alternative based on the moderate OE hazard level in Area C; therefore, surface clearance is ranked 1 (best) in terms of community acceptance. The community would be more likely to consider a subsurface clearance to depth of detection in Area C over institutional controls or NAI, due to the UXO item that was found subsurface in this area during the Phase II EE/CA field investigation; therefore, subsurface clearance to depth of detection is ranked 2 (second best), institutional controls is ranked 3 (third best), and NAI is ranked 4 (last).

8.1.3.4 Overall Implementability Ranking for Alternatives 1 through 4.

Surface Clearance of OE (Alternative 3) is ranked as the best overall OE response action alternative in terms of implementability for Area C (see Table 8-11), based upon the ease with which it can be implemented and its acceptance by local agencies and the community. Although NAI (Alternative 1) is ranked 2 (second best) in terms of implementability, it is not considered by local agencies or the community as an acceptable or appropriate OE response action alternative for Area C, due to the moderate OE hazard level in this area. Subsurface Clearance of OE to Depth of Detection (Alternative 4) is ranked 3 (third best) based on technical and administrative feasibility issues and the lack of immediate availability of services and materials. Institutional Controls (Alternative 2) is ranked 4 (last), based on technical and administrative feasibility issues and its lack of acceptance by local agencies and the community as an effective stand-alone alternative.

8.1.3.5 Cost.

Table 8-12 provides the cost criteria of the four alternatives for Area C. The evaluation of each of these alternatives is presented below.

Table 8-12. Cost Criteria Evaluation for Area C

Alternative	Cost	Investment	Benefit	Score	Rank
1, No Action Indicated (NAI)	$0	1	4	5	3
2, Institutional Controls	$1,133,972	2	2	4	1
3, Surface Clearance	$7,286,640	3	1	4	1
4, Subsurface Clearance to Depth	$73,295,048	4	3	7	4

Note: Ranking from best to worst; best = 1.

Investment and Benefit. There is no cost associated with NAI; therefore, NAI is ranked 1 (best) in terms of investment. The alternative that provides the greatest benefit, in terms of dollars spent to effect results, appears to be the surface clearance. Institutional controls is ranked 2 (second best) because it offers the opportunity to educate the community concerning the danger associated with OE in this area and has the potential to offer a reduction in the potential for OE exposure similar to that of a surface clearance. Subsurface clearance to depth of detection is ranked 3 (third best) due to the cost. NAI is ranked 4 (last) because it would offer no benefit in terms of reduction of exposure to OE.

8.1.3.6 Overall Cost Ranking for Alternatives 1 through 4.

Institutional Controls (Alternative 2) and Surface Clearance of OE (Alternative 3) are both ranked as the most acceptable alternatives in terms of cost for Area C. Both of these alternatives offer the ability to reduce the potential for exposure to OE in terms of cost benefit and investment. NAI (Alternative 1) is ranked 3 (third best) because it would offer no reduction in the potential for exposure to OE. Subsurface Clearance of OE to Depth of Detection (Alternative 4) is ranked 4 (last) because the high cost of this alternative outweighs the benefit in the reduction in risk to be gained as a result of implementation.

8.1.3.7 Overall Ranking of Alternatives for Area C.

The overall ranking of the different alternatives in terms of their effectiveness, implementability, and cost is presented in Table 8-13. The alternative with the lowest score is considered best for each criterion (effectiveness, implementability, and cost) evaluated.

Table 8-13. Alternative Evaluation for Area C

Alternative	Effectiveness Rank	Implementability Rank	Cost Rank	Overall Score	Overall Rank
1, No Action Indicated (NAI)	4	2	3	9	4
2, Institutional Controls	3	4	1	8	2
3, Surface Clearance	2	1	1	4	1
4, Subsurface Clearance to Depth	1	3	4	8	2

Note: Ranking from best to worst; best = 1.

Surface Clearance of OE (Alternative 3) is ranked as the best overall OE response action alternative for Area C due to the moderate OE hazard level in this area. Institutional Controls (Alternative 2) and the Subsurface Clearance of OE to Depth of Detection (Alternative 4) are tied as the second best alternatives for Area C. NAI (Alternative 1) is ranked 4 (last) because it would not protect the public from OE in an area with a moderate OE hazard level. Specific recommendations for Area C are made in Chapter 9.0, Recommended OE Response Action Alternatives.

8.1.4 Area D

The overall OE hazard level in this area is high (see Figure 8-1), based on the results of the Phase II EE/CA field investigation and evaluation of the three risk factors (OE Type, Site Characteristics, and Site Demographics) defined in the qualitative risk assessment (Chapter 4.0). Using this information, the four OE response action alternatives evaluated in this EE/CA report are comparatively analyzed in the following subsections to determine the most appropriate OE response action alternative for Area D.

8.1.4.1 Effectiveness.

Table 8-14 provides the effectiveness criteria of the four alternatives for Area D. The evaluation of each of these alternatives is presented below.

Table 8-14. Effectiveness Criteria Evaluation for Area D

	Effectiveness					
Alternative	Protection of Human Safety	Compliance with ARARs	Long Term	Short Term	Score	Rank
1, No Action Indicated (NAI)	NA	NC	NC	NC	NC	NC
2, Institutional Controls	3	1	3	3	10	3
3, Surface Clearance	2	1	2	1	6	2
4, Subsurface Clearance to Depth	1	1	1	2	5	1

Note: Ranking from best to worst; best = 1.
ARAR = applicable or relevant and appropriate requirement
NA = not applicable
NC = not considered

Protection of Human Safety. NAI is considered an unacceptable OE response action alternative for Area D because it does not meet the minimum threshold criterion for the protection of human safety; therefore, NAI is not evaluated further as an acceptable OE response action alternative for Area D. Institutional controls is ranked 3 (third best) for protection of human safety because it does not involve the removal of OE and is therefore less protective of human safety in an area with a high OE hazard level than surface clearance or subsurface clearance to depth of detection. Surface clearance is ranked 2 (second best) and subsurface clearance to depth of detection is ranked 1 (best) for protection of human safety, based upon their ability to provide the greatest reduction in risk associated with the high OE hazard level in this area.

Compliance with ARARs. Compliance with ARARs has been ranked equally among Alternatives 2 through 4, as full compliance with the ARARs is expected with minimal impact to the environment.

Long-term Effectiveness. Institutional controls is ranked 3 (last) because it would not be effective over the long term in reducing the risk associated with the high OE hazard level in Area D. Surface clearance is ranked 2 (second best), as it would be more effective over the long term than institutional controls, but less effective over the long term than a subsurface clearance to depth of detection. Subsurface clearance to depth of detection is ranked 1 (best) because it would provide the maximum protection of human safety and would be the most effective OE response action alternative over the long term.

Short-term Effectiveness. Institutional controls is ranked 3 (last) for short-term effectiveness because of the length of time necessary to implement the alternative to the point that it affords protection. The time involved includes identifying landowners and responsible agencies, meeting with landowners and local agencies to confirm the location of display cases and warning signs, and coordination of the distribution of informational pamphlets and establishment of local community awareness meetings. Surface clearance is ranked 1 (best) for short-term effectiveness, as it would take less time to implement and would be more effective over the short term than institutional controls or a subsurface clearance to depth of detection. Subsurface clearance to depth of detection ranked 2 (second best) for short-term effectiveness, as it would take significantly more time to implement than a surface clearance, but less time to implement than institutional controls.

8.1.4.2 Overall Effectiveness Ranking for Alternatives 1 through 4.

Subsurface Clearance of OE to Depth of Detection (Alternative 4) is ranked as the best overall alternative in terms of effectiveness for Area D (see Table 8-14), based on its ability to reduce the risk associated with the high OE hazard level in this area and because it provides the most effective protection to the public from OE. Surface Clearance of OE (Alternative 3) is ranked 2 (second best) because it would not offer the most effective protection to the public and would not be the most effective OE response action alternative over the long term. Institutional Controls (Alternative 2) is ranked 3 (last) because it would take too much time to coordinate with landowners and local agencies and would not be effective as a stand alone alternative in an area with a high OE hazard level.

8.1.4.3 Implementability.

Table 8-15 provides the implementability criteria of the four alternatives for Area D. The evaluation of each of these alternatives is presented below.

Technical and Administrative Feasibility. Implementing the institutional controls alternative would require more logistical and management support than a clearance action because the process must be conducted in close coordination with local agencies and the community. Although the supplies and personnel needed to construct display cases, install warning signs, conduct educational

Table 8-15. Implementability Criteria Evaluation for Area D

Alternative	Implementability: Technical Feasibility	Implementability: Administrative Feasibility	Implementability: Services and Materials	Implementability: Local Agency Acceptance	Implementability: Community Acceptance	Score	Rank
2, Institutional Controls	3	3	1	3	3	13	3
3, Surface Clearance	1	1	2	2	2	8	1
4, Subsurface Clearance to Depth	2	2	3	1	1	9	2

Note: Ranking from best to worst; best = 1.

programs, and implement and oversee use restrictions are readily available; the length of time necessary to identify landowners, coordinate the implementation of institutional controls with landowners, and implement institutional controls would be much greater than the relatively short length of time required to implement a clearance action. Therefore, institutional controls is ranked 3 (last) from a technical and administrative feasibility standpoint.

Implementation of a surface clearance would be quite feasible from a technical and administrative perspective. The surface clearance would be relatively easier to implement than institutional controls or the subsurface clearance to depth of detection. Therefore, surface clearance is ranked 1 (best) for technical and administrative feasibility.

From technical and administrative perspectives, implementation of a subsurface clearance to depth of detection is quite feasible. This alternative generally requires less logistical and management support than institutional controls, but requires more logistical and management support than a surface clearance. Unlike a surface clearance, a subsurface clearance requires excavation equipment (in addition to specially trained and qualified personnel and a means of OE disposal, which is required for all clearance actions). Therefore, the subsurface clearance to depth of detection is ranked 2 (second best) in terms of technical and administrative feasibility, as it would take more time and effort to implement than the surface clearance, but less time and effort to implement than institutional controls.

Services and Materials. Institutional controls is ranked 1 (best) because the supplies and personnel needed to construct and install display cases and warning signs, conduct educational programs, and implement and oversee use restrictions are readily available. Surface clearance is ranked 2 (second best) because it would require specially trained and qualified personnel as well as the means of disposing of any encountered OE. Unlike a surface clearance, implementation of a subsurface clearance to depth of detection requires excavation equipment (in addition to specially trained and qualified personnel and a means of OE disposal, which is required for all clearance actions); therefore, this alternative is ranked 3 (last) for availability of services and materials.

Local Agency Acceptance. Based on interaction with agency representatives to date, it has been determined that local agencies are likely to consider the

subsurface clearance to depth of detection as the most appropriate and acceptable alternative for Area D, based on the high OE hazard level and that the area is easily accessible to the public. Surface clearance is ranked 2 (second best) and institutional controls is ranked 3 (last).

Community Acceptance. Based on interaction with the community during the EE/CA investigation and during RAB meetings, the community is likely to consider the subsurface clearance to depth of detection as the most appropriate and acceptable alternative for Area D, based on the high OE hazard level and that the area is easily accessible by the local community. Surface clearance, because it would only remove OE (if present) from the surface, is ranked 2 (second best). Institutional controls alone would not reduce the OE hazard level in this area and would not be an effective alternative unless it is implemented in conjunction with a clearance action; therefore, institutional controls is ranked 3 (last) for Area D.

8.1.4.4 Overall Implementability Ranking for Alternatives 1 through 4.

Surface Clearance of OE (Alternative 3) is ranked as the best overall alternative in terms of implementability for Area D (see Table 8-15), due to the high OE hazard level and that the area is easily accessible by the local community. Subsurface Clearance of OE to Depth of Detection (Alternative 4) is ranked 2 (second best) based on implementability issues. Institutional Controls (Alternative 2) is ranked 3 (last) because it would not be considered as an acceptable stand-alone alternative to local agencies and the community, as it does not involve the removal of OE.

8.1.4.5 Cost.

Table 8-16 provides the cost criteria of the four alternatives for Area D. The evaluation of each of these alternatives is presented below.

Table 8-16. Cost Criteria Evaluation for Area D

Alternative	Cost	Investment	Benefit	Score	Rank
2, Institutional Controls	$1,500,514	1	3	4	2
3, Surface Clearance	$10,116,735	2	1	3	1
4, Subsurface Clearance to Depth	$100,946,594	3	2	5	3

Note: Ranking from best to worst; best = 1.

Investment and Benefit. There are minimal costs associated with institutional controls; therefore, institutional controls is ranked 1 (best) in terms of investment. The alternative that provides the greatest benefit, in terms of dollars spent to effect results, appears to be the surface clearance, followed by the subsurface clearance to depth of detection and institutional controls. The cost of implementing institutional controls is lower than that of any clearance alternative; however, the benefit of implementation in protecting human safety would be much lower than the benefit of either the surface or subsurface clearance actions.

8.1.4.6 Overall Cost Ranking for Alternatives 1 through 4.

Surface Clearance of OE (Alternative 3) is ranked as the best OE response action alternative in terms of cost for Area D (see Table 8-16), based upon its ability to reduce the OE hazard level and potential for exposure to OE in this area for dollars spent to effect results. Institutional Controls (Alternative 2) is ranked 2 (second best) because it has the ability to reduce the OE hazard level in this area and the benefit of implementation could be similar to that of a surface clearance, depending on local agency and community support and involvement. The Subsurface Clearance of OE to Depth of Detection (Alternative 4) is ranked 3 (last) based on cost.

8.1.4.7 Overall Ranking of Alternatives for Area D.

The overall ranking of the different alternatives in terms of their effectiveness, implementability, and cost is presented in Table 8-17. The alternative with the lowest score is considered best for each criterion (effectiveness, implementability, and cost) evaluated.

Table 8-17. Alternative Evaluation for Area D

Alternative	Effectiveness Rank	Implementability Rank	Cost Rank	Overall Score	Overall Rank
2, Institutional Controls	3	3	2	8	3
3, Surface Clearance	2	1	1	4	1
4, Subsurface Clearance to Depth	1	2	3	6	2

Note: Ranking from best to worst; best = 1.

Surface Clearance of OE (Alternative 3) is ranked as the best overall OE response action alternative for Area D due to the high OE hazard level and the current use of this area by the local community. The Subsurface Clearance of OE to Depth of Detection (Alternative 4) is ranked 2 (second best), based on cost and implementability issues. Institutional Controls (Alternative 2), because it would not be accepted by local agencies or the community as an acceptable or appropriate OE response action alternative in this area, is ranked 3 (last). Specific recommendations for Area D are made in Chapter 9.0, Recommended OE Response Action Alternatives.

8.1.5 Area E

The overall OE hazard level in this area is moderate (see Figure 8-1), based on the results of the Phase II EE/CA field investigation and evaluation of the three risk factors (OE Type, Site Characteristics, and Site Demographics) defined in the qualitative risk assessment (Chapter 4.0). Using this information, the four OE response action alternatives evaluated in this EE/CA report are comparatively analyzed in the following subsections to determine the most appropriate OE response action alternative for Area E.

8.1.5.1 Effectiveness.

Table 8-18 provides the effectiveness criteria of the four alternatives for Area E. The evaluation of each of these alternatives is presented below.

Table 8-18. Effectiveness Criteria Evaluation for Area E

	Effectiveness					
Alternative	Protection of Human Safety	Compliance with ARARs	Long Term	Short Term	Score	Rank
1, No Action Indicated (NAI)	4	1	4	4	13	4
2, Institutional Controls	3	1	3	3	10	3
3, Surface Clearance	2	1	2	1	6	2
4, Subsurface Clearance to Depth	1	1	1	2	5	1

Notes: Ranking from best to worst; best = 1.
ARAR = applicable or relevant and appropriate requirement

Protection of Human Safety. If the NAI alternative were implemented, the potential for exposure to OE would remain unchanged; therefore, NAI is ranked 4 (last) for protection of human safety. Institutional controls is ranked 3 (third best) for protection of human safety because it would not involve the removal of ordnance in an area with a moderate OE hazard level and would, therefore, not be the most effective in protecting human safety. Surface clearance would reduce the potential for exposure to OE in this area; therefore, surface clearance is ranked 2 (second best) in terms of protection of human safety. Subsurface clearance to depth of detection is ranked 1 (best) because it would offer the greatest reduction in exposure to OE and provide the maximum protection of human safety in an area with a moderate OE hazard level.

Compliance with ARARs. Compliance with ARARs has been ranked equally among Alternatives 1 through 4, as full compliance with the ARARs is expected with minimal impact to the environment.

Long-term Effectiveness. NAI is ranked 4 (last) in terms of long-term effectiveness because it would offer no reduction in risk over the long term. Institutional controls is ranked 3 (third best) because it would not be effective over the long term in reducing the risk associated with the moderate OE hazard level in Area E. Surface clearance is ranked 2 (second best), as it would be more effective over the long term than institutional controls, but less effective over the long term than a subsurface clearance to depth of detection. Subsurface clearance to depth of detection is ranked 1 (best) because it would provide the maximum protection of human safety and would be the most effective OE response action alternative over the long term.

Short-term Effectiveness. NAI is ranked 4 (last) in terms of short-term effectiveness because it would offer no reduction in risk over the short term. Institutional controls is ranked 3 (third best) for short-term effectiveness because of the length of time necessary to implement the alternative to the point that it affords protection. The time involved with implementation of institutional controls

includes identifying landowners and responsible agencies, meeting with landowners and local agencies to confirm the location of display cases and warning signs, and coordination of the distribution of informational pamphlets and establishment of local community awareness meetings. Surface clearance is ranked 1 (best) for short term effectiveness, as it would take less time to implement and would be more effective over the short-term than institutional controls or a subsurface clearance to depth of detection. Subsurface clearance to depth of detection is ranked 2 (second best) for short-term effectiveness, as it would take significantly more time to implement than a surface clearance, but less time to implement than institutional controls.

8.1.5.2 Overall Effectiveness Ranking for Alternatives 1 through 4.

Subsurface Clearance of OE to Depth of Detection (Alternative 4) is ranked as the best OE response action alternative in terms of effectiveness for Area E (see Table 8-18), based upon its ability to reduce the potential risk of OE exposure and provide the most effective protection to the public from OE. Surface Clearance of OE (Alternative 3) is ranked 2 (second best), and Institutional Controls (Alternative 2) is ranked 3 (third best) because both would offer less protection to the public than the subsurface clearance to depth of detection in an area with a moderate OE hazard level. NAI (Alternative 1) is ranked 4 (last) because it would do nothing to protect human safety.

8.1.5.3 Implementability.

Table 8-19 provides the implementability criteria of the four alternatives for Area E. The evaluation of each of these alternatives is presented below.

Table 8-19. Implementability Criteria Evaluation for Area E

	Implementability						
Alternative	Technical Feasibility	Administrative Feasibility	Services and Materials	Local Agency Acceptance	Community Acceptance	Score	Rank
1, No Action Indicated (NAI)	1	1	1	4	4	11	2
2, Institutional Controls	4	4	2	3	3	16	4
3, Surface Clearance	2	2	3	1	1	9	1
4, Subsurface Clearance to Depth	3	3	4	2	2	14	3

Note: Ranking from best to worst; best = 1.

Technical and Administrative Feasibility. Implementing the NAI alternative would be easier than implementing any of the other alternatives, from both an administrative and a technical feasibility perspective, as no effort, materials, or services would be required. Therefore, NAI is ranked 1 (best) for technical and administrative feasibility.

Implementing institutional controls would require more logistical and management support than a clearance action because the process must be conducted in close coordination with local agencies, landowners, and the community. Although the supplies and personnel needed to construct display

cases, install warning signs, conduct educational programs, and implement and oversee use restrictions are readily available, the length of time necessary to identify landowners and coordinate the implementation of institutional controls with landowners would be much greater than the relatively short length of time required to implement a clearance action. Therefore, institutional controls is ranked 4 (last) from a technical and administrative feasibility standpoint.

Implementation of a surface clearance would be quite feasible from a technical and administrative perspective. While relatively easier to implement than institutional controls or the subsurface clearance to depth of detection, a surface clearance would require more effort to implement than NAI (which requires no effort). Therefore, surface clearance is ranked 2 (second best) for technical and administrative feasibility.

From technical and administrative perspectives, implementation of a subsurface clearance to depth of detection is quite feasible. This alternative generally requires less logistical and management support than institutional controls, but requires more logistical and management support than a surface clearance or NAI. Unlike a surface clearance, a subsurface clearance to depth of detection requires excavation equipment (in addition to specially trained and qualified personnel and a means of OE disposal, which is required for all clearance actions). Therefore, subsurface clearance to depth of detection is ranked 3 (third best) in terms of technical and administrative feasibility, as it would take more time and effort to implement than a surface clearance or NAI, but less time and effort to implement than institutional controls.

Services and Materials. NAI is ranked 1 (best) for services and materials, as no effort, materials, or services would be required. Institutional controls is ranked 2 (second best) because the supplies and personnel needed to construct and install warning signs, conduct educational programs, and implement and oversee use restrictions are readily available. Surface clearance is ranked 3 (third best) because it would require specially trained and qualified personnel as well as the means of disposing of any encountered OE. Unlike a surface clearance, implementation of a subsurface clearance to depth of detection requires excavation equipment (in addition to specially trained and qualified personnel and a means of OE disposal, which is required for all clearance actions). Therefore, subsurface clearance to depth of detection is ranked 4 (last) for availability of services and materials.

Local Agency Acceptance. Based on interaction with agency representatives to date, it has been determined that local agencies are likely to consider a surface clearance as the most acceptable alternative based on the moderate OE hazard level in Area E; therefore, surface clearance is ranked 1 (best) in terms of local agency acceptance. Local agencies would be more likely to consider a subsurface clearance to depth of detection in Area E over institutional controls or NAI; therefore, subsurface clearance to depth of detection is ranked 2 (second best), institutional controls is ranked 3 (third best), and NAI is ranked 4 (last).

Community Acceptance. Based on interaction with the community during the EE/CA investigation and during RAB meetings, the community is likely to consider a surface clearance as the most acceptable alternative based on the moderate OE hazard level in Area E; therefore, surface clearance is ranked 1 (best) in terms of community acceptance. The community would be more likely to consider a subsurface clearance to depth of detection in Area E over institutional controls or NAI; therefore, subsurface clearance to depth of detection is ranked 2 (second best), institutional controls is ranked 3 (third best), and NAI is ranked 4 (last).

8.1.5.4 Overall Implementability Ranking for Alternatives 1 through 4.

Surface Clearance of OE (Alternative 3) is ranked as the best overall OE response action alternative in terms of implementability for Area E (see Table 8-19), based upon the ease with which it can be implemented and its acceptance by local agencies and the community. Although NAI (Alternative 1) is ranked 2 (second best) in terms of implementability, it is not considered by local agencies or the community as an acceptable or appropriate OE response action alternative for Area E, due to the moderate OE hazard level in this area. Subsurface Clearance of OE to Depth of Detection (Alternative 4) is ranked 3 (third best), based on technical and administrative feasibility issues and the lack of immediate availability of services and materials. Institutional Controls (Alternative 2) is ranked 4 (last), based on technical and administrative feasibility issues and its lack of acceptance by local agencies and the community as an effective stand-alone alternative.

8.1.5.5 Cost.

Table 8-20 provides the cost criteria of the four alternatives for Area E. The evaluation of each of these alternatives is presented below.

Table 8-20. Cost Criteria Evaluation for Area E

Alternative	Cost	Investment	Benefit	Score	Rank
1, No Action Indicated (NAI)	$0	1	4	5	3
2, Institutional Controls	$729,209	2	2	4	1
3, Surface Clearance	$4,816,810	3	1	4	1
4, Subsurface Clearance to Depth	$47,546,570	4	3	7	4

Note: Ranking from best to worst; best = 1.

Investment and Benefit. There is no cost associated with NAI; therefore, NAI is ranked 1 (best) in terms of investment. The alternative that provides the greatest benefit, in terms of dollars spent to effect results, appears to be the surface clearance. Institutional controls is ranked 2 (second best) because it offers the opportunity to educate the community concerning the danger associated with OE in this area and has the potential to offer a reduction in the potential for OE exposure similar to that of a surface clearance. Subsurface clearance to depth of detection is ranked 3 (third best) due to the cost. NAI is ranked 4 (last) because it would offer no benefit in terms of reduction of exposure to OE.

8.1.5.6 Overall Cost Ranking for Alternatives 1 through 4.

Institutional Controls (Alternative 2) and Surface Clearance of OE (Alternative 3) are both ranked as the most acceptable alternatives in terms of cost for Area E. Both of these alternatives offer the ability to reduce the potential for exposure to OE in terms of cost benefit and investment. NAI (Alternative 1) is ranked 3 (third best) because it would offer no reduction in the potential for exposure to OE. Subsurface Clearance of OE to Depth of Detection (Alternative 4) is ranked 4 (last) because the high cost of this alternative far outweighs the benefit in reduction to be gained as a result of implementation.

8.1.5.7 Overall Ranking of Alternatives for Area E.

The overall ranking of the different alternatives in terms of their effectiveness, implementability, and cost is presented in Table 8-21. The alternative with the lowest score is considered best for each criterion (effectiveness, implementability, and cost) evaluated.

Table 8-21. Alternative Evaluation for Area E

Alternative	Effectiveness Rank	Implementability Rank	Cost Rank	Overall Score	Overall Rank
1, No Action Indicated (NAI)	4	2	3	9	4
2, Institutional Controls	3	4	1	8	2
3, Surface Clearance	2	1	1	4	1
4, Subsurface Clearance to Depth	1	3	4	8	2

Note: Ranking from best to worst; best = 1.

Surface Clearance of OE (Alternative 3) is ranked as the best overall OE response action alternative for Area E due to the moderate OE hazard level in this area. Institutional Controls (Alternative 2) and the Subsurface Clearance of OE to Depth of Detection (Alternative 4) are tied as the second best alternatives for Area E. NAI (Alternative 1) is ranked 4 (last) because it would not protect the public from OE in an area with a moderate OE hazard level. Specific recommendations for Area E are made in Chapter 9.0, Recommended OE Response Action Alternatives.

8.1.6 Area F

The overall OE hazard level in this area is low (see Figure 8-1), based on the results of the Phase II EE/CA field investigation and evaluation of the three risk factors (OE Type, Site Characteristics, and Site Demographics) defined in the qualitative risk assessment (Chapter 4.0). Using this information, the four OE response action alternatives evaluated in this EE/CA report are comparatively analyzed in the following subsections to determine the most appropriate OE response action alternatives for Area F.

8.1.6.1 Effectiveness.

Table 8-22 provides the effectiveness criteria of the four alternatives for Area F. The evaluation of each of these alternatives is presented below.

Table 8-22. Effectiveness Criteria Evaluation for Area F

	Effectiveness					
Alternative	Protection of Human Safety	Compliance with ARARs	Long Term	Short Term	Score	Rank
1, No Action Indicated (NAI)	4	1	4	1	10	3
2, Institutional Controls	1	1	1	2	5	1
3, Surface Clearance	2	1	2	3	8	2
4, Subsurface Clearance to Depth	3	1	3	4	11	4

Note: Ranking from best to worst; best = 1.
ARAR = applicable or relevant and appropriate requirement

Protection of Human Safety. Although the OE hazard level in this area is low, there will always be a residual risk associated with OE at the former maneuver area, based on past military use of the site; therefore, institutional controls, because of its ability to educate the public concerning the risk associated with OE, is ranked 1 (best) for protection of human safety. Because the OE hazard level in this area is low, there is essentially little to be gained with regard to the protection of human safety by performing a surface clearance or subsurface clearance to depth of detection in this area; therefore, surface clearance is ranked 2 (second best) and subsurface clearance to depth of detection is ranked 3 (third best). NAI is ranked 4 (last) because it would do nothing to protect human safety, even in an area with only a residual risk.

Compliance with ARARs. Compliance with ARARs has been ranked equally among Alternatives 1 through 4, as full compliance with the ARARs is expected with minimal impact to the environment.

Long-term Effectiveness. Institutional controls, in an area with a low OE hazard level, would be the most effective alternative over the long term because it would educate and inform the public concerning the residual risk associated with OE in this area. Because the OE hazard level in this area is low, there is essentially little to be gained in terms of effectiveness over the long term by performing a surface clearance or subsurface clearance to depth of detection; therefore, the surface clearance is ranked 2 (second best) and the subsurface clearance to depth of detection is ranked 3 (third best). NAI is ranked 4 (last) because it would not be an effective risk reduction measure over the long-term.

Short-term Effectiveness. Since the OE hazard level in this area is low, NAI would be the most effective alternative over the short term. Institutional controls is ranked 2 (second best) for short-term effectiveness because it would require an extended effort and additional time to coordinate with landowners and local agencies for implementation. The level of short-term effectiveness gained from a surface clearance or subsurface clearance to depth of detection is relatively

lower than the effectiveness of NAI or institutional controls because the OE hazard level is already low; therefore, surface clearance is ranked 3 (third best) and subsurface clearance to depth of detection is ranked 4 (last).

8.1.6.2 Overall Effectiveness Ranking for Alternatives 1 through 4.

Institutional Controls (Alternative 2) is ranked as the most effective OE response action alternative because the OE hazard level is this area is already low. Surface Clearance of OE (Alternative 3) is ranked 2 (second best) and NAI (Alternative 1), is ranked 3 (third best). Because the OE hazard level in this area is already low, there would be minimal effectiveness in performing a subsurface clearance to depth of detection; therefore, Subsurface Clearance of OE to Depth of Detection (Alternative 4) is ranked 4 (last) in terms of effectiveness.

8.1.6.3 Implementability.

Table 8-23 provides the implementability criteria of the four alternatives for Area F. The evaluation of each of these alternatives is presented below.

Table 8-23. Implementability Criteria Evaluation for Area F

	Implementability						
Alternative	Technical Feasibility	Administrative Feasibility	Services and Materials	Local Agency Acceptance	Community Acceptance	Score	Rank
1, No Action Indicated (NAI)	1	1	1	4	4	11	1
2, Institutional Controls	4	4	2	1	1	12	3
3, Surface Clearance	2	2	3	2	2	11	1
4, Subsurface Clearance to Depth	3	3	4	3	3	16	4

Note: Ranking from best to worst; best = 1.

Technical and Administrative Feasibility. Implementing the NAI alternative would be easier than implementing any of the other alternatives, from both an administrative and a technical feasibility perspective, as no effort, materials, or services would be required. Therefore, NAI is ranked 1 (best) for technical and administrative feasibility.

Implementing institutional controls would require more logistical and management support than a clearance action because the process must be conducted in close coordination with local agencies, landowners, and the community. Although the supplies and personnel needed to construct display cases, install warning signs, conduct educational programs, and implement and oversee use restrictions are readily available, the length of time necessary to identify landowners and coordinate the implementation of institutional controls with landowners would be much greater than the relatively short length of time required to implement a clearance action. Therefore, institutional controls is ranked 4 (last), from a technical and administrative feasibility standpoint.

Implementation of a surface clearance would be quite feasible from a technical and administrative perspective. While relatively easier to implement than

institutional controls or a subsurface clearance to depth of detection, the surface clearance would require more effort to implement than NAI (which requires no effort). Therefore, surface clearance is ranked 2 (second best) for technical and administrative feasibility.

From technical and administrative perspectives, implementation of a subsurface clearance to depth of detection is quite feasible. This alternative generally requires less logistical and management support than institutional controls, but requires more logistical and management support than a surface clearance or NAI. Unlike a surface clearance, a subsurface clearance to depth of detection requires excavation equipment (in addition to specially trained and qualified personnel and a means of OE disposal, which is required for all clearance actions). Therefore, subsurface clearance to depth of detection is ranked 3 (third best) in terms of technical and administrative feasibility, as it would take more time and effort to implement than a surface clearance or NAI, but less time and effort to implement than institutional controls.

Services and Materials. NAI is ranked 1 (best) for services and materials, as no effort, materials, or services would be required. Institutional controls is ranked 2 (second best) because the supplies and personnel needed to construct display cases, install warning signs, conduct educational programs, and implement and oversee use restrictions are readily available. Surface clearance is ranked 3 (third best) because it would require specially trained and qualified personnel as well as the means of disposing of any encountered OE. Unlike a surface clearance, implementation of a subsurface clearance to depth of detection requires excavation equipment (in addition to specially trained and qualified personnel and a means of OE disposal, which is required for all clearance actions). Therefore, subsurface clearance to depth of detection is ranked 4 (last) for availability of services and materials.

Local Agency Acceptance. Based on interaction with agency representatives to date, it has been determined that local agencies are likely to consider institutional controls as the most acceptable alternative in this area, based on the low OE hazard level and the land use in Area F; therefore, institutional controls is ranked 1 (best) in terms of local agency acceptance. Local agencies are more likely to consider a surface clearance or a subsurface clearance to depth of detection over NAI because there will always be a residual risk (no matter how small) associated with OE in this area (given past military use of the land). Therefore, the surface clearance ranked 2 (second best) and the subsurface clearance to depth of detection ranked 3 (third best). NAI ranked 4 (last) in terms of local agency acceptance.

Community Acceptance. Based on interaction with the community during the EE/CA investigation and during RAB meetings, the community is likely to consider institutional controls as the most acceptable alternative based on the low OE hazard level in this area; therefore, institutional controls is ranked 1 (best) in terms of community acceptance. The community is more likely to consider surface clearance or subsurface clearance to depth of detection over NAI because there will always be a residual risk (no matter how small) associated with OE in this area (given past military use of the land). Therefore, surface

clearance is ranked 2 (second best), and subsurface clearance to depth of detection is ranked 3 (third best). NAI is ranked 4 (last) in terms of community acceptance.

8.1.6.4 Overall Implementability Ranking for Alternatives 1 through 4.

NAI (Alternative 1) and Surface Clearance of OE (Alternative 3) are both ranked as the best overall OE response action alternatives in terms of implementability for Area F (see Table 8-23), based upon the low OE hazard level in this area. Institutional Controls (Alternative 2) is ranked 3 (third best) based on technical and administrative feasibility issues. Subsurface Clearance of OE to Depth of Detection (Alternative 4) is ranked 4 (last) based on technical and administrative feasibility issues and the lack of immediate availability of services and materials.

8.1.6.5 Cost.

Table 8-24 provides the cost criteria of the four alternatives for Area F. The evaluation of each of these alternatives is presented below.

Table 8-24. Cost Criteria Evaluation for Area F

Alternative	Cost	Investment	Benefit	Score	Rank
1, No Action Indicated (NAI)	$0	1	2	3	1
2, Institutional Controls	$1,405,929	2	1	3	1
3, Surface Clearance	$8,947,480	3	3	6	3
4, Subsurface Clearance to Depth	$96,482,432	4	4	8	4

Note: Ranking from best to worst; best = 1.

Investment and Benefit. There is no cost associated with NAI; therefore, NAI is ranked 1 (best) in terms of investment. The alternative that provides the greatest benefit, in terms of dollars spent to effect results, appears to be institutional controls. Although the OE hazard level in this area is low, it would be beneficial to inform and educate the public concerning the dangers associated with ordnance. Because the OE hazard level is already low, there would be minimal (if any) risk reduction benefits that could be gained by performing a surface clearance or a subsurface clearance to depth of detection.

8.1.6.6 Overall Cost Ranking for Alternatives 1 through 4.

NAI (Alternative 1) and Institutional Controls (Alternative 2) are both ranked as the best overall alternative in terms of cost for Area F. The OE hazard level in this area is already low; therefore, NAI and institutional controls are tied as the most cost-effective alternatives. Because the OE hazard level in this area is already low, very little benefit would be gained by implementing Surface Clearance of OE (Alternative 3) or Subsurface Clearance of OE to Depth of Detection (Alternative 4).

8.1.6.7 Overall Ranking of Alternatives for Area F.

The overall ranking of the different alternatives in terms of their effectiveness, implementability, and cost is presented in Table 8-25. The alternative with the lowest score is considered best for each criterion (effectiveness, implementability, and cost) evaluated.

Table 8-25. Alternative Evaluation for Area F

Alternative	Effectiveness Rank	Implementability Rank	Cost Rank	Overall Score	Overall Rank
1, No Action Indicated (NAI)	3	1	1	5	1
2, Institutional Controls	1	3	1	5	1
3, Surface Clearance	2	1	3	6	3
4, Subsurface Clearance to Depth	4	4	4	12	4

Note: Ranking from best to worst; best = 1.

Because the OE hazard level in Area F is low and there are no plans for future development, NAI (Alternative 1) and Institutional Controls (Alternative 2) are both ranked as the best overall OE response action alternatives. Very little benefit would be gained by conducting extensive risk reduction efforts in an area where the OE hazard is already low; therefore, Surface Clearance of OE (Alternative 3) is ranked 3 (third best) and Subsurface Clearance of OE to Depth of Detection (Alternative 4) is ranked 4 (last). Specific recommendations for Area F are made in Chapter 9.0, Recommended OE Response Action Alternatives.

8.2 GROUP II LAND USE

8.2.1 Area G

The overall OE hazard level in this area is low (see Figure 8-1), based on the results of the Phase II EE/CA field investigation and evaluation of the three risk factors (OE Type, Site Characteristics, and Site Demographics) defined in the qualitative risk assessment (Chapter 4.0). Using this information, the four OE response action alternatives evaluated in this EE/CA report are comparatively analyzed in the following subsections to determine the most appropriate OE response action alternatives for Area G.

8.2.1.1 Effectiveness.

Table 8-26 provides the effectiveness criteria of the four alternatives for Area G. The evaluation of each of these alternatives is presented below.

Protection of Human Safety. Although the OE hazard level in this area is low, there will always be a residual risk associated with OE at the former maneuver area based on past military use of the site; therefore, institutional controls, because of its ability to educate the public concerning the risk associated with OE, is ranked 1 (best) for protection of human safety. Because the OE hazard level in this area is low, there is essentially little to be gained with regard to

Table 8-26. Effectiveness Criteria Evaluation for Area G

Alternative	Effectiveness: Protection of Human Safety	Effectiveness: Compliance with ARARs	Effectiveness: Long Term	Effectiveness: Short Term	Score	Rank
1, No Action Indicated (NAI)	4	1	4	1	10	3
2, Institutional Controls	1	1	1	2	5	1
3, Surface Clearance	2	1	2	3	8	2
4, Subsurface Clearance to Depth	3	1	3	4	11	4

Note: Ranking from best to worst; best = 1.
ARAR = applicable or relevant and appropriate requirement

protection of human safety by performing a surface clearance or subsurface clearance to depth of detection in this area; therefore, the surface clearance is ranked 2 (second best) and the subsurface clearance to depth of detection is ranked 3 (third best). NAI is ranked 4 (last) because it would do nothing to protect human safety, even in an area with only a residual risk.

Compliance with ARARs. Compliance with ARARs has been ranked equally among Alternatives 1 through 4, as full compliance with the ARARs is expected with minimal impact to the environment.

Long-term Effectiveness. Institutional controls, in an area with a low OE hazard level, would be the most effective alternative over the long term because it would educate and inform the public concerning the residual risk associated with OE in this area. Because the OE hazard level in this area is low, there is essentially little to be gained in terms of effectiveness over the long term by performing a surface clearance or subsurface clearance to depth of detection; therefore, the surface clearance is ranked 2 (second best) and the subsurface clearance to depth of detection is ranked 3 (third best). NAI is ranked 4 (last) because it would not be an effective risk reduction measure over the long term.

Short-term Effectiveness. Since the OE hazard level in this area is low, NAI would be the most effective alternative over the short term. Institutional controls is ranked 2 (second best) for short-term effectiveness because it would require an extended effort and additional time to coordinate with landowners and local agencies for implementation. The level of short-term effectiveness gained from a surface clearance or subsurface clearance to depth of detection is relatively lower than the effectiveness of NAI or institutional controls because the OE hazard level is already low; therefore, surface clearance is ranked 3 (third best) and subsurface clearance to depth of detection is ranked 4 (last).

8.2.1.2 Overall Effectiveness Ranking for Alternatives 1 through 4.

Institutional Controls (Alternative 2) is ranked as the most effective OE response action alternative because the OE hazard level is this area is already low. Surface Clearance of OE (Alternative 3) is ranked 2 (second best) and NAI (Alternative 1) is ranked 3 (third best). Because the OE hazard level in this area is already low, there would be minimal effectiveness in performing a subsurface

clearance to depth of detection; therefore, Subsurface Clearance of OE to Depth of Detection (Alternative 4) is ranked 4 (last) in terms of effectiveness.

8.2.1.3 Implementability.

Table 8-27 provides the implementability criteria of the four alternatives for Area G. The evaluation of each of these alternatives is presented below.

Table 8-27. Implementability Criteria Evaluation for Area G

	Implementability						
Alternative	Technical Feasibility	Administrative Feasibility	Services and Materials	Local Agency Acceptance	Community Acceptance	Score	Rank
1, No Action Indicated (NAI)	1	1	1	4	4	11	1
2, Institutional Controls	4	4	2	1	1	12	3
3, Surface Clearance	2	2	3	2	2	11	1
4, Subsurface Clearance to Depth	3	3	4	3	3	16	4

Note: Ranking from best to worst; best = 1.

Technical and Administrative Feasibility. Implementing the NAI alternative would be easier than implementing any of the other alternatives, from both an administrative and a technical feasibility perspective, as no effort, materials, or services would be required. Therefore, NAI ranked 1 (best) for technical and administrative feasibility.

Implementing institutional controls would require more logistical and management support than a clearance action because the process must be conducted in close coordination with local agencies, landowners, and the community. Although the supplies and personnel needed to construct display cases, install warning signs, conduct educational programs, and implement and oversee use restrictions are readily available, the length of time necessary to identify landowners and coordinate the implementation of institutional controls with landowners would be much greater than the relatively short length of time required to implement a clearance action. Therefore, institutional controls is ranked 4 (last) from a technical and administrative feasibility standpoint.

Implementation of a surface clearance would be quite feasible from a technical and administrative perspective. While relatively easier to implement than institutional controls or the subsurface clearance to depth of detection, the surface clearance would require more effort to implement than NAI (which requires no effort). Therefore, surface clearance is ranked 2 (second best) for technical and administrative feasibility.

From technical and administrative perspectives, implementation of a subsurface clearance to depth of detection is quite feasible. This alternative generally requires less logistical and management support than institutional controls, but requires more logistical and management support than a surface clearance or NAI. Unlike a surface clearance, a subsurface clearance to depth of detection requires excavation equipment (in addition to specially trained and qualified

personnel and a means of OE disposal, which is required for all clearance actions). Therefore, subsurface clearance to depth of detection is ranked 3 (third best) in terms of technical and administrative feasibility, as it would take more time and effort to implement than a surface clearance or NAI, but less time and effort to implement than institutional controls.

Services and Materials. NAI is ranked 1 (best) for services and materials, as no effort, materials, or services would be required. Institutional controls is ranked 2 (second best) because the supplies and personnel needed to construct and install warning signs, conduct educational programs, and implement and oversee use restrictions are readily available. Surface clearance is ranked 3 (third best) because it would require specially trained and qualified personnel as well as the means of disposing of any encountered OE. Unlike a surface clearance, implementation of a subsurface clearance to depth of detection requires excavation equipment (in addition to specially trained and qualified personnel and a means of OE disposal). Therefore, subsurface clearance to depth of detection is ranked 4 (last) for availability of services and materials.

Local Agency Acceptance. Based on interaction with agency representatives to date, it has been determined that local agencies are likely to consider institutional controls as the most acceptable alternative in this area, based on the low OE hazard level and the land use in Area G; therefore, institutional controls is ranked 1 (best) in terms of local agency acceptance. Local agencies are more likely to consider a surface clearance or a subsurface clearance to depth of detection over NAI because there will always be a residual risk (no matter how small) associated with OE in this area (given past military use of the land). Therefore, surface clearance is ranked 2 (second best), and subsurface clearance to depth of detection is ranked 3 (third best). NAI is ranked 4 (last) in terms of local agency acceptance.

Community Acceptance. Based on interaction with the community during the EE/CA investigation and during RAB meetings, the community is likely to consider institutional controls as the most acceptable alternative based on the low OE hazard level in this area; therefore, institutional controls is ranked 1 (best) in terms of community acceptance. The community is more likely to consider a surface clearance or a subsurface clearance to depth of detection over NAI because there will always be a residual risk (no matter how small) associated with OE in this area (given past military use of the land). Therefore, the surface clearance is ranked 2 (second best) and the subsurface clearance to depth of detection is ranked 3 (third best). NAI is ranked 4 (last) in terms of community acceptance.

8.2.1.4 Overall Implementability Ranking for Alternatives 1 through 4.

NAI (Alternative 1) and Surface Clearance of OE (Alternative 3) are both ranked as the best overall OE response action alternatives in terms of implementability for Area G (see Table 8-27), based upon the low OE hazard level in this area. Institutional Controls (Alternative 2) is ranked 3 (third best), based on technical and administrative feasibility issues. Subsurface Clearance of OE to Depth of

Detection (Alternative 4) is ranked 4 (last), based on technical and administrative feasibility issues and the lack of immediate availability of services and materials.

8.2.1.5 Cost.

Table 8-28 provides the cost criteria of the four alternatives for Area G. The evaluation of each of these alternatives is presented below.

Table 8-28. Cost Criteria Evaluation for Area G

Alternative	Cost	Investment	Benefit	Score	Rank
1, No Action Indicated (NAI)	$0	1	2	3	1
2, Institutional Controls	$2,382,610	2	1	3	1
3, Surface Clearance	$14,977,305	3	3	6	3
4, Subsurface Clearance to Depth	$154,217,552	4	4	8	4

Note: Ranking from best to worst; best = 1.

Investment and Benefit. There is no cost associated with NAI; therefore, NAI is ranked 1 (best) in terms of investment. The alternative that provides the greatest benefit, in terms of dollars spent to effect results, appears to be institutional controls. Although the OE hazard level in this area is low, it would be beneficial to inform and educate the public concerning the dangers associated with ordnance. Because the OE hazard level is already low, there would be minimal (if any) risk reduction benefits that could be gained by performing a surface clearance or a subsurface clearance to depth of detection.

8.2.1.6 Overall Cost Ranking for Alternatives 1 through 4.

NAI (Alternative 1) and Institutional Controls (Alternative 2) are both ranked as the best overall alternative in terms of cost for Area G. The OE hazard level in this area is already low; therefore, NAI and institutional controls are tied as the most cost-effective alternatives. Because the OE hazard level in this area is already low, very little benefit would be gained by implementing Surface Clearance of OE (Alternative 3) or Subsurface Clearance of OE to Depth of Detection (Alternative 4).

8.2.1.7 Overall Ranking of Alternatives for Area G.

The overall ranking of the different alternatives in terms of their effectiveness, implementability, and cost is presented in Table 8-29. The alternative with the lowest score is considered best for each criterion (effectiveness, implementability, and cost) evaluated.

Table 8-29. Alternative Evaluation for Area G

Alternative	Effectiveness Rank	Implementability Rank	Cost Rank	Overall Score	Overall Rank
1, No Action Indicated (NAI)	3	1	1	5	1
2, Institutional Controls	1	3	1	5	1
3, Surface Clearance	2	1	3	6	3
4, Subsurface Clearance to Depth	4	4	4	12	4

Note: Ranking from best to worst; best = 1.

Because the OE hazard level in Area G is low, NAI (Alternative 1) and Institutional Controls (Alternative 2) are both ranked as the best overall OE response action alternatives. Very little benefit would be gained by conducting extensive risk reduction efforts in an area where the OE hazard is already low; therefore, Surface Clearance of OE (Alternative 3) is ranked 3 (third best) and Subsurface Clearance of OE to Depth of Detection (Alternative 4) is ranked 4 (last). Specific recommendations for Area G are made in Chapter 9.0, Recommended OE Response Action Alternatives.

8.2.2 Area H

The overall OE hazard level in this area is low (see Figure 8-1), based on the results of the Phase II EE/CA field investigation and evaluation of the three risk factors (OE Type, Site Characteristics, and Site Demographics) defined in the qualitative risk assessment (Chapter 4.0). Using this information, the four OE response action alternatives evaluated in this EE/CA report are comparatively analyzed in the following subsections to determine the most appropriate OE response action alternatives for Area H.

8.2.2.1 Effectiveness.

Table 8-30 provides the effectiveness criteria of the four alternatives for Area H. The evaluation of each of these alternatives is presented below.

Table 8-30. Effectiveness Criteria Evaluation for Area H

	Effectiveness					
Alternative	Protection of Human Safety	Compliance with ARARs	Long Term	Short Term	Score	Rank
1, NAI	4	1	4	1	10	3
2, Institutional Controls	1	1	1	2	5	1
3, Surface Clearance	2	1	2	3	8	2
4, Subsurface Clearance to Depth	3	1	3	4	11	4

Note: Ranking from best to worst; best = 1.
ARAR = applicable or relevant and appropriate requirement

Protection of Human Safety. Although the OE hazard level in this area is low, there will always be a residual risk associated with OE at the former maneuver area based on past military use of the site; therefore, institutional controls, because of its ability to educate the public concerning the risk associated with OE, is ranked 1 (best) for protection of human safety. Because the OE hazard level in this area is low, there is essentially little to be gained with regard to protection of human safety by performing a surface clearance or subsurface clearance to depth of detection in this area; therefore, the surface clearance is ranked 2 (second best) and the subsurface clearance to depth of detection is ranked 3 (third best). NAI is ranked 4 (last) because it would do nothing to protect human safety, even in an area with only a residual risk.

Compliance with ARARs. Compliance with ARARs has been ranked equally among Alternatives 1 through 4, as full compliance with the ARARs is expected with minimal impact to the environment.

Long-term Effectiveness. Institutional controls, in an area with a low OE hazard level, would be the most effective alternative over the long-term because it would educate and inform the public concerning the residual risk associated with OE in this area. Because the OE hazard level in this area is low, there is essentially little to be gained in terms of effectiveness over the long term by performing a surface clearance or subsurface clearance to depth of detection; therefore, surface clearance is ranked 2 (second best) and subsurface clearance to depth of detection is ranked 3 (third best). NAI is ranked 4 (last) because it would not be an effective risk reduction measure over the long term.

Short-term Effectiveness. Since the OE hazard level in this area is low, NAI would be the most effective alternative over the short term. Institutional controls is ranked 2 (second best) for short-term effectiveness because it would require an extended effort and additional time to coordinate with landowners and local agencies for implementation. The level of short-term effectiveness gained from a surface clearance or subsurface clearance to depth of detection is relatively lower than the effectiveness of NAI or institutional controls because the OE hazard level is already low; therefore, surface clearance is ranked 3 (third best) and subsurface clearance to depth of detection is ranked 4 (last).

8.2.2.2 Overall Effectiveness Ranking for Alternatives 1 through 4.

Institutional Controls (Alternative 2) is ranked as the most effective OE response action alternative because the OE hazard level is this area is already low. Surface Clearance of OE (Alternative 3) is ranked 2 (second best), and NAI (Alternative 1) is ranked 3 (third best). Because the OE hazard level in this area is already low, there would be minimal effectiveness in performing a subsurface clearance to depth of detection; therefore, Subsurface Clearance of OE to Depth of Detection (Alternative 4) is ranked 4 (last) in terms of effectiveness.

8.2.2.3 Implementability.

Table 8-31 provides the implementability criteria of the four alternatives for Area H. The evaluation of each of these alternatives is presented below.

Table 8-31. Implementability Criteria Evaluation for Area H

	Implementability						
Alternative	Technical Feasibility	Administrative Feasibility	Services and Materials	Local Agency Acceptance	Community Acceptance	Score	Rank
1, No Action Indicated (NAI)	1	1	1	4	4	11	1
2, Institutional Controls	4	4	2	1	1	12	3
3, Surface Clearance	2	2	3	2	2	11	1
4, Subsurface Clearance to Depth	3	3	4	3	3	16	4

Note: Ranking from best to worst; best = 1.

Technical and Administrative Feasibility. Implementing the NAI alternative would be easier than implementing any of the other alternatives, from both an administrative and a technical feasibility perspective, as no effort, materials, or services would be required. Therefore, NAI is ranked 1 (best) for technical and administrative feasibility.

Implementing institutional controls would require more logistical and management support than a clearance action because the process must be conducted in close coordination with local agencies, landowners, and the community. Although the supplies and personnel needed to construct display cases, install warning signs, conduct educational programs, and implement and oversee use restrictions are readily available, the length of time necessary to identify landowners and coordinate the implementation of institutional controls with landowners would be much greater than the relatively short length of time required to implement a clearance action. Therefore, institutional controls is ranked 4 (last) from a technical and administrative feasibility standpoint.

Implementation of a surface clearance would be quite feasible from a technical and administrative perspective. While relatively easier to implement than institutional controls or the subsurface clearance to depth of detection, the surface clearance would require more effort to implement than NAI (which requires no effort). Therefore, surface clearance is ranked 2 (second best) for technical and administrative feasibility.

From technical and administrative perspectives, implementation of a subsurface clearance to depth of detection is quite feasible. This alternative generally requires less logistical and management support than institutional controls, but requires more logistical and management support than a surface clearance or NAI. Unlike a surface clearance, a subsurface clearance to depth of detection requires excavation equipment (in addition to specially trained and qualified personnel and a means of OE disposal, which is required for all clearance actions). Therefore, subsurface clearance to depth of detection is ranked 3 (third best) in terms of technical and administrative feasibility, as it would take more time and effort to implement than a surface clearance or NAI, but less time and effort to implement than institutional controls.

Services and Materials. NAI is ranked 1 (best) for services and materials, as no effort, materials, or services would be required. Institutional controls is ranked 2 (second best) because the supplies and personnel needed to construct display cases, install warning signs, conduct educational programs, and implement and oversee use restrictions, are readily available. Surface clearance is ranked 3 (third best) because it would require specially trained and qualified personnel as well as the means of disposing of any encountered OE. Unlike a surface clearance, implementation of a subsurface clearance to depth of detection requires excavation equipment (in addition to specially trained and qualified personnel and a means of OE disposal, which is required for all clearance actions). Therefore, subsurface clearance to depth of detection is ranked 4 (last) for availability of services and materials.

Local Agency Acceptance. Based on interaction with agency representatives to date, it has been determined that local agencies are likely to consider institutional controls as the most acceptable alternative in this area, based on the low OE hazard level and the land use in Area H; therefore, institutional controls is ranked 1 (best) in terms of local agency acceptance. Local agencies are more likely to consider a surface clearance or a subsurface clearance to depth of detection over NAI because there will always be a residual risk (no matter how small) associated with OE in this area (given past military use of the land). Therefore, surface clearance is ranked 2 (second best) and subsurface clearance to depth of detection is ranked 3 (third best). NAI is ranked 4 (last) in terms of local agency acceptance.

Community Acceptance. Based on interaction with the community during the EE/CA investigation and during RAB meetings, the community is likely to consider institutional controls as the most acceptable alternative based on the low OE hazard level in this area; therefore, institutional controls is ranked 1 (best) in terms of community acceptance. The community is more likely to consider a surface clearance or a subsurface clearance to depth of detection over NAI because there will always be a residual risk (no matter how small) associated with OE in this area (given past military use of the land). Therefore, the surface clearance is ranked 2 (second best) and the subsurface clearance to depth of detection is ranked 3 (third best). NAI is ranked 4 (last) in terms of community acceptance.

8.2.2.4 Overall Implementability Ranking for Alternatives 1 through 4.

NAI (Alternative 1) and Surface Clearance of OE (Alternative 3) are both ranked as the best overall OE response action alternatives in terms of implementability for Area H (see Table 8-31), based upon the low OE hazard level in this area. Institutional Controls (Alternative 2) is ranked 3 (third best) based on technical and administrative feasibility issues. Subsurface Clearance of OE to Depth of Detection (Alternative 4) is ranked 4 (last) based on technical and administrative feasibility issues and the lack of immediate availability of services and materials.

8.2.2.5 Cost.

Table 8-32 provides the cost criteria of the four alternatives for Area H. The evaluation of each of these alternatives is presented below.

Table 8-32. Cost Criteria Evaluation for Area H

Alternative	Cost	Investment	Benefit	Score	Rank
1, No Action Indicated (NAI)	$0	1	2	3	1
2, Institutional Controls	$1,468,105	2	1	3	1
3, Surface Clearance	$9,391,745	3	3	6	3
4, Subsurface Clearance to Depth	$94,976,420	4	4	8	4

Note: Ranking from best to worst; best = 1.

Investment and Benefit. There is no cost associated with NAI; therefore, NAI is ranked 1 (best) in terms of investment. The alternative that provides the greatest benefit, in terms of dollars spent to effect results, appears to be institutional controls. Although the OE hazard level in this area is low, it would be beneficial to inform and educate the public concerning the dangers associated with ordnance. Because the OE hazard level is already low, there would be minimal (if any) risk reduction benefits that could be gained by performing a surface clearance or a subsurface clearance to depth of detection.

8.2.2.6 Overall Cost Ranking for Alternatives 1 through 4.

NAI (Alternative 1) and Institutional Controls (Alternative 2) are both ranked as the best overall alternative in terms of cost for Area H. The OE hazard level in this area is already low; therefore, NAI and institutional controls are tied as the most cost-effective alternatives. Because the OE hazard level in this area is already low, very little benefit would be gained by implementing Surface Clearance of OE (Alternative 3) or Subsurface Clearance of OE to Depth of Detection (Alternative 4).

8.2.2.7 Overall Ranking of Alternatives for Area H.

The overall ranking of the different alternatives in terms of their effectiveness, implementability, and cost is presented in Table 8-33. The alternative with the lowest score is considered best for each criterion (effectiveness, implementability, and cost) evaluated.

Table 8-33. Alternative Evaluation for Area H

Alternative	Effectiveness Rank	Implementability Rank	Cost Rank	Overall Score	Overall Rank
1, No Action Indicated (NAI)	3	1	1	5	1
2, Institutional Controls	1	3	1	5	1
3, Surface Clearance	2	1	3	6	3
4, Subsurface Clearance to Depth	4	4	4	12	4

Note: Ranking from best to worst; best = 1.

Because the OE hazard level in Area H is low and there are no plans for future development, NAI (Alternative 1) and Institutional Controls (Alternative 2) are both ranked as the best overall OE response action alternatives. Very little benefit would be gained by conducting extensive risk reduction efforts in an area where the OE hazard is already low; therefore, Surface Clearance of OE (Alternative 3) is ranked 3 (third best) and the Subsurface Clearance of OE to Depth of Detection (Alternative 4) is ranked 4 (last). Specific recommendations for Area H are made in Chapter 9.0, Recommended OE Response Action Alternatives.

8.2.3 Area I

The overall OE hazard level in this area is low (see Figure 8-1), based on the results of the Phase II EE/CA field investigation and evaluation of the three risk factors (OE Type, Site Characteristics, and Site Demographics) defined in the qualitative risk assessment (Chapter 4.0). Using this information, the four OE response action alternatives evaluated in this EE/CA report are comparatively analyzed in the following subsections to determine the most appropriate OE response action alternatives for Area I.

8.2.3.1 Effectiveness.

Table 8-34 provides the effectiveness criteria of the four alternatives for Area I. The evaluation of each of these alternatives is presented below.

Table 8-34. Effectiveness Criteria Evaluation for Area I

	Effectiveness					
Alternative	Protection of Human Safety	Compliance with ARARs	Long Term	Short Term	Score	Rank
1, No Action Indicated (NAI)	4	1	4	1	10	3
2, Institutional Controls	1	1	1	2	5	1
3, Surface Clearance	2	1	2	3	8	2
4, Subsurface Clearance to Depth	3	1	3	4	11	4

Note: Ranking from best to worst; best = 1.
ARAR = applicable or relevant and appropriate requirement

Protection of Human Safety. Although the OE hazard level in this area is low, there will always be a residual risk associated with OE at the former maneuver area based on past military use of the site; therefore, institutional controls, because of its ability to educate the public concerning the risk associated with OE, is ranked 1 (best) for protection of human safety. Because the OE hazard level in this area is low, there is essentially little to be gained with regard to protection of human safety by performing a surface clearance or subsurface clearance to depth of detection in this area; therefore, the surface clearance is ranked 2 (second best) and the subsurface clearance to depth of detection is ranked 3 (third best). NAI is ranked 4 (last) because it would do nothing to protect human safety, even in an area with only a residual risk.

Compliance with ARARs. Compliance with ARARs has been ranked equally among Alternatives 1 through 4, as full compliance with the ARARs is expected with minimal impact to the environment.

Long-term Effectiveness. Institutional controls, in an area with a low OE hazard level, would be the most effective alternative over the long term because it would educate and inform the public concerning the residual risk associated with OE in this area. Because the OE hazard level in this area is low, there is essentially little to be gained in terms of effectiveness over the long term by performing a surface clearance or subsurface clearance to depth of detection;

therefore, surface clearance is ranked 2 (second best) and subsurface clearance to depth of detection is ranked 3 (third best). NAI is ranked 4 (last) because it would not be an effective risk reduction measure over the long term.

Short-term Effectiveness. Since the OE hazard level in this area is low, NAI would be the most effective alternative over the short term. Institutional controls is ranked 2 (second best) for short-term effectiveness because it would require an extended effort and additional time to coordinate with landowners and local agencies for implementation. The level of short-term effectiveness gained from a surface clearance or subsurface clearance to depth of detection is relatively lower than the effectiveness of NAI or institutional controls because the OE hazard level is already low; therefore, surface clearance is ranked 3 (third best) and subsurface clearance to depth of detection is ranked 4 (last).

8.2.3.2 Overall Effectiveness Ranking for Alternatives 1 through 4.

Institutional Controls (Alternative 2) is ranked as the most effective OE response action alternative because the OE hazard level is this area is already low. Surface Clearance of OE (Alternative 3) is ranked 2 (second best) and NAI (Alternative 1) is ranked 3 (third best). Because the OE hazard level in this area is already low, there would be minimal effectiveness in performing a subsurface clearance; therefore, Subsurface Clearance of OE to Depth of Detection (Alternative 4) is ranked 4 (last) in terms of effectiveness.

8.2.3.3 Implementability.

Table 8-35 provides the implementability criteria of the four alternatives for Area I. The evaluation of each of these alternatives is presented below.

Table 8-35. Implementability Criteria Evaluation for Area I

	Implementability						
Alternative	Technical Feasibility	Administrative Feasibility	Services and Materials	Local Agency Acceptance	Community Acceptance	Score	Rank
1, No Action Indicated (NAI)	1	1	1	4	4	11	2
2, Institutional Controls	4	4	2	1	3	14	3
3, Surface Clearance	2	2	3	2	1	10	1
4, Subsurface Clearance to Depth	3	3	4	3	2	15	4

Note: Ranking from best to worst; best = 1.

Technical and Administrative Feasibility. Implementing the NAI alternative would be easier than implementing any of the other alternatives, from both an administrative and a technical feasibility perspective, as no effort, materials, or services would be required. Therefore, NAI ranked 1 (best) for technical and administrative feasibility.

Implementing institutional controls would require more logistical and management support than a clearance action because the process must be conducted in close coordination with local agencies, landowners, and the

community. Although the supplies and personnel needed to construct display cases, install warning signs, conduct educational programs, and implement and oversee use restrictions are readily available, the length of time necessary to identify landowners and coordinate the implementation of institutional controls with landowners would be much greater than the relatively short length of time required to implement a clearance action. Therefore, institutional controls is ranked 4 (last) from a technical and administrative feasibility standpoint.

Implementation of a surface clearance would be quite feasible from a technical and administrative perspective. While relatively easier to implement than institutional controls or the subsurface clearance to depth of detection, the surface clearance would require more effort to implement than NAI (which requires no effort). Therefore, surface clearance is ranked 2 (second best) for technical and administrative feasibility.

From technical and administrative perspectives, implementation of a subsurface clearance to depth of detection is quite feasible. This alternative generally requires less logistical and management support than institutional controls, but requires more logistical and management support than a surface clearance or NAI. Unlike a surface clearance, a subsurface clearance to depth of detection requires excavation equipment (in addition to specially trained and qualified personnel and a means of OE disposal, which is required for all clearance actions). Therefore, subsurface clearance to depth of detection is ranked 3 (third best) in terms of technical and administrative feasibility, as it would take more time and effort to implement than a surface clearance or NAI, but less time and effort to implement than institutional controls.

Services and Materials. NAI is ranked 1 (best) for services and materials, as no effort, materials, or services would be required. Institutional controls is ranked 2 (second best) because the supplies and personnel needed to construct display cases, install warning signs, conduct educational programs, and implement and oversee use restrictions are readily available. Surface clearance is ranked 3 (third best) because it would require specially trained and qualified personnel as well as the means of disposing of any encountered OE. Unlike a surface clearance, implementation of a subsurface clearance to depth of detection requires excavation equipment (in addition to specially trained and qualified personnel and a means of OE disposal, which is required for all clearance actions). Therefore, subsurface clearance to depth of detection is ranked 4 (last) for availability of services and materials.

Local Agency Acceptance. Based on interaction with agency representatives to date, it has been determined that local agencies are likely to consider institutional controls as the most acceptable alternative in this area, based on the low OE hazard level and the land use in Area I; therefore, institutional controls is ranked 1 (best) in terms of local agency acceptance. Local agencies are more likely to consider a surface clearance or a subsurface clearance to depth of detection over NAI because there will always be a residual risk (no matter how small) associated with OE in this area (given past military use of the land). Therefore, the surface clearance is ranked 2 (second best) and the subsurface

clearance to depth of detection is ranked 3 (third best). NAI is ranked 4 (last) in terms of local agency acceptance.

Community Acceptance. Based on interaction with the community during the EE/CA investigation and during RAB meetings, the community is likely to consider a surface clearance as the most acceptable alternative based on the OE scrap recovered on the surface in this area and the potential for future development; therefore, surface clearance is ranked 1 (best) in terms of community acceptance. The community is more likely to consider a subsurface clearance to depth of detection or institutional controls over NAI due to the projected future land use for this area. Therefore, the subsurface clearance to depth of detection is ranked 2 (second best) and institutional controls is ranked 3 (third best). NAI is ranked 4 (last) in terms of community acceptance.

8.2.3.4 Overall Implementability Ranking for Alternatives 1 through 4.

Surface Clearance of OE (Alternative 3) is ranked as the best overall OE response action alternative in terms of implementability for Area I (see Table 8-35), based upon the low OE hazard level and the future land use in this area. NAI (Alternative 1) is ranked 2 (second best) based on technical and administrative feasibility. Institutional Controls (Alternative 2) is ranked 3 (third best), based on technical and administrative feasibility issues and that it is not considered the most acceptable alternative to the local community. Subsurface Clearance of OE to Depth of Detection (Alternative 4) is ranked 4 (last), based on technical and administrative feasibility issues and the lack of immediate availability of services and materials.

8.2.3.5 Cost.

Table 8-36 provides the cost criteria of the four alternatives for Area I. The evaluation of each of these alternatives is presented below.

Table 8-36. Cost Criteria Evaluation for Area I

Alternative	Cost	Investment	Benefit	Score	Rank
1, No Action Indicated (NAI)	$0	1	2	3	1
2, Institutional Controls	$794,908	2	1	3	1
3, Surface Clearance	$5,284,655	3	3	6	3
4, Subsurface Clearance to Depth	$51,285,668	4	4	8	4

Note: Ranking from best to worst; best = 1.

Investment and Benefit. There is no cost associated with NAI; therefore, NAI is ranked 1 (best) in terms of investment. The alternative that provides the greatest benefit, in terms of dollars spent to effect results, appears to be institutional controls. Although the OE hazard level in this area is low, it would be beneficial to inform and educate the public concerning the dangers associated with ordnance. Because the OE hazard level is already low, there would be minimal (if any) risk reduction benefits that could be gained by performing a surface clearance or a subsurface clearance to depth of detection.

8.2.3.6 Overall Cost Ranking for Alternatives 1 through 4.

NAI (Alternative 1) and Institutional Controls (Alternative 2) are both ranked as the best overall alternative in terms of cost for Area I. The OE hazard level in this area is already low; therefore, NAI and institutional controls are tied as the most cost-effective alternatives. Because the OE hazard level in this area is already low, very little benefit would be gained by implementing Surface Clearance of OE (Alternative 3) or Subsurface Clearance of OE to Depth of Detection (Alternative 4).

8.2.3.7 Overall Ranking of Alternatives for Area I.

The overall ranking of the different alternatives in terms of their effectiveness, implementability, and cost is presented in Table 8-37. The alternative with the lowest score is considered best for each criterion (effectiveness, implementability, and cost) evaluated.

Table 8-37. Alternative Evaluation for Area I

Alternative	Effectiveness Rank	Implementability Rank	Cost Rank	Overall Score	Overall Rank
1, No Action Indicated (NAI)	3	2	1	6	2
2, Institutional Controls	1	3	1	5	1
3, Surface Clearance	2	1	3	6	2
4, Subsurface Clearance to Depth	4	4	4	12	4

Note: Ranking from best to worst; best = 1.

Because of the possibility of future development and the low OE hazard level for Area I, Institutional Controls (Alternative 2) is ranked as the best overall OE response action alternative. Very little benefit would be gained by conducting extensive risk reduction efforts in an area where the OE hazard level is already low; therefore, Surface Clearance of OE (Alternative 3) and NAI (Alternative 1) are both ranked 2 (second best). The Subsurface Clearance of OE to Depth of Detection (Alternative 4) is ranked 4 (last), based on cost benefit and implementability issues. Specific recommendations for Area I are made in Chapter 9.0, Recommended OE Response Action Alternatives.

8.2.4 Area J

The overall OE hazard level in this area is high (see Figure 8-1), based on the results of the Phase II EE/CA field investigation and evaluation of the three risk factors (OE Type, Site Characteristics, and Site Demographics) defined in the qualitative risk assessment (Chapter 4.0). Using this information, the four OE response action alternatives evaluated in this EE/CA report are comparatively analyzed in the following subsections to determine the most appropriate OE response action alternatives for Area J.

8.2.4.1 Effectiveness.

Table 8-38 provides the effectiveness criteria of the four alternatives for Area J. The evaluation of each of these alternatives is presented below.

Table 8-38. Effectiveness Criteria Evaluation for Area J

	Effectiveness					
Alternative	Protection of Human Safety	Compliance with ARARs	Long Term	Short Term	Score	Rank
1, No Action Indicated (NAI)	NA	NC	NC	NC	NC	NC
2, Institutional Controls	3	1	3	3	10	3
3, Surface Clearance	2	1	2	1	6	2
4, Subsurface Clearance to Depth	1	1	1	2	5	1

Note: Ranking from best to worst; best = 1.
ARAR = applicable or relevant and appropriate requirement
NA = not applicable
NC = not considered

Protection of Human Safety. NAI is considered an unacceptable OE response action alternative for Area J because it does not meet the minimum threshold criterion for the protection of human safety; therefore, NAI is not evaluated further as an acceptable OE response action alternative for Area J. Institutional controls is ranked 3 (third best) for protection of human safety because it does not involve the removal of OE and is therefore less protective of human safety in an area with a high OE hazard level than the surface clearance or the subsurface clearance to depth of detection. Surface clearance is ranked 2 (second best) and subsurface clearance to depth of detection is ranked 1 (best) for protection of human safety based upon their ability to provide the greatest reduction in risk associated with the high OE hazard level in this area.

Compliance with ARARs. Compliance with ARARs has been ranked equally among Alternatives 2 through 4, as full compliance with the ARARs is expected with minimal impact to the environment.

Long-term Effectiveness. Institutional controls is ranked 3 (last) because it would not be effective over the long term in reducing the risk associated with the high OE hazard level in Area J. Surface clearance is ranked 2 (second best), as it would be more effective over the long term than institutional controls, but less effective over the long term than a subsurface clearance to depth of detection. Subsurface clearance to depth of detection is ranked 1 (best) because it would provide the maximum protection of human safety and would be the most effective OE response action alternative over the long term.

Short-term Effectiveness. Institutional controls is ranked 3 (last) for short-term effectiveness because of the length of time necessary to implement the alternative to the point that it affords protection. The time involved includes identifying landowners and responsible agencies, meeting with landowners and local agencies to confirm the location of display cases and warning signs, and coordination of the distribution of informational pamphlets and establishment of

local community awareness meetings. Surface clearance is ranked 1 (best) for short-term effectiveness, as it would take less time to implement and would be more effective over the short term than institutional controls or a subsurface clearance to depth of detection. Subsurface clearance to depth of detection is ranked 2 (second best) for short-term effectiveness, as it would take significantly more time to implement than a surface clearance, but less time to implement than institutional controls.

8.2.4.2 Overall Effectiveness Ranking for Alternatives 1 through 4.

Subsurface Clearance of OE to Depth of Detection (Alternative 4) is ranked as the best overall alternative in terms of effectiveness for Area J (see Table 8-38), based upon its ability to reduce the risk associated with the high OE hazard level in this area and because it provides the most effective protection to the public from OE. Surface Clearance of OE (Alternative 3) is ranked 2 (second best) because it would not offer the most effective protection to the public and would not be the most effective OE response action alternative over the long term. Institutional Controls (Alternative 2) is ranked 3 (last) because it would take too much time to coordinate with landowners and local agencies and would not be effective as a stand-alone alternative in an area with a high OE hazard level.

8.2.4.3 Implementability.

Table 8-39 provides the implementability criteria of the four alternatives for Area J. The evaluation of each of these alternatives is presented below.

Table 8-39. Implementability Criteria Evaluation for Area J

	Implementability						
Alternative	Technical Feasibility	Administrative Feasibility	Services and Materials	Local Agency Acceptance	Community Acceptance	Score	Rank
2, Institutional Controls	3	3	1	3	3	13	3
3, Surface Clearance	1	1	2	2	2	8	1
4, Subsurface Clearance to Depth	2	2	3	1	1	9	2

Note: Ranking from best to worst; best = 1.

Technical and Administrative Feasibility. Implementing the institutional controls alternative would require more logistical and management support than a clearance action because the process must be conducted in close coordination with local agencies and the community. Although the supplies and personnel needed to construct display cases, install warning signs, conduct educational programs, and implement and oversee use restrictions are readily available; the length of time necessary to identify landowners and coordinate the implementation of institutional controls with landowners would be much greater than the relatively short length of time required to implement a clearance action. Therefore, institutional controls is ranked 3 (last) from a technical and administrative feasibility standpoint.

Implementation of a surface clearance would be quite feasible from a technical and administrative perspective. The surface clearance would be relatively easier to implement than institutional controls or subsurface clearance to depth of detection. Therefore, surface clearance is ranked 1 (best) for technical and administrative feasibility.

From technical and administrative perspectives, implementation of a subsurface clearance to depth of detection is quite feasible. This alternative generally requires less logistical and management support than institutional controls, but requires more logistical and management support than a surface clearance. Unlike a surface clearance, a subsurface clearance requires excavation equipment (in addition to specially trained and qualified personnel and a means of OE disposal, which is required for all clearance actions). Therefore, the subsurface clearance to depth of detection is ranked 2 (second best) in terms of technical and administrative feasibility, as it would take more time and effort to implement than the surface clearance, but less time and effort to implement than institutional controls.

Services and Materials. Institutional controls is ranked 1 (best) because the supplies and personnel needed to construct and install display cases and warning signs, conduct educational programs, and implement and oversee use restrictions are readily available. Surface clearance is ranked 2 (second best) because it would require specially trained and qualified personnel as well as the means of disposing of any encountered OE. Unlike a surface clearance, implementation of a subsurface clearance to depth of detection requires excavation equipment (in addition to specially trained and qualified personnel and a means of OE disposal). Therefore, this alternative is ranked 3 (last) for availability of services and materials.

Local Agency Acceptance. Based on interaction with agency representatives to date, it has been determined that local agencies are likely to consider the subsurface clearance to depth of detection as the most appropriate and acceptable alternative for Area J, based on the high OE hazard level and that the area is easily accessible. Surface clearance is ranked 2 (second best) and institutional controls is ranked 3 (last).

Community Acceptance. Based on interaction with the community during the EE/CA investigation and during RAB meetings, the community is likely to consider the subsurface clearance to depth of detection as the most appropriate and acceptable alternative for Area J, based on the high OE hazard level and that the area is easily accessible by the local community. Surface clearance, because it would only remove OE (if present) from the surface, is ranked 2 (second best). Institutional controls alone would not reduce the OE hazard level in this area and would not be an effective alternative unless it is implemented in conjunction with a clearance action; therefore, institutional controls is ranked 3 (last) for Area J.

8.2.4.4 Overall Implementability Ranking for Alternatives 1 through 4.

Surface Clearance of OE (Alternative 3) is ranked as the best overall alternative in terms of implementability for Area J (see Table 8-39) due to the high OE hazard level and that the area is easily accessible by the local community. Subsurface Clearance of OE to Depth of Detection (Alternative 4) is ranked 2 (second best), based on implementability issues. Institutional Controls (Alternative 2) is ranked 3 (last) because it would not be considered as an acceptable stand-alone alternative to local agencies and the community, as it does not involve the removal of OE.

8.2.4.5 Cost.

Table 8-40 provides the cost criteria of the four alternatives for Area J. The evaluation of each of these alternatives is presented below.

Table 8-40. Cost Criteria Evaluation for Area J

Alternative	Cost	Investment	Benefit	Score	Rank
2, Institutional Controls	$283,053	1	3	4	2
3, Surface Clearance	$2,167,065	2	1	3	1
4, Subsurface Clearance to Depth	$19,299,812	3	2	5	3

Note: Ranking from best to worst; best = 1.

Investment and Benefit. There are minimal costs associated with institutional controls; therefore, institutional controls is ranked 1 (best) in terms of investment. The alternative that provides the greatest benefit, in terms of dollars spent to effect results, appears to be the surface clearance, followed by the subsurface clearance to depth of detection, and institutional controls. The cost of implementing institutional controls is lower than that of any clearance alternative; however, the benefit of implementation in protecting human safety would be much lower than the benefit of either the surface or subsurface clearance actions.

8.2.4.6 Overall Cost Ranking for Alternatives 1 through 4.

Surface Clearance of OE (Alternative 3) is ranked as the best OE response action alternative in terms of cost for Area J (see Table 8-40), based upon its ability to reduce the OE hazard level and potential for exposure to OE in this area for dollars spent to effect results. Institutional Controls (Alternative 2) is ranked 2 (second best) because it has the ability to reduce the OE hazard level in this area, and the benefit of implementation could be similar to that of a surface clearance, depending on local agency and community support and involvement. The Subsurface Clearance of OE to Depth of Detection (Alternative 4) is ranked 3 (last), based on cost.

8.2.4.7 Overall Ranking of Alternatives for Area J.

The overall ranking of the different alternatives in terms of their effectiveness, implementability, and cost is presented in Table 8-41. The alternative with the lowest score is considered best for each criterion (effectiveness, implementability, and cost) evaluated.

Table 8-41. Alternative Evaluation for Area J

Alternative	Effectiveness Rank	Implementability Rank	Cost Rank	Overall Score	Overall Rank
2, Institutional Controls	3	3	2	8	3
3, Surface Clearance	2	1	1	4	1
4, Subsurface Clearance to Depth	1	2	3	6	2

Note: Ranking from best to worst; best = 1.

Surface Clearance of OE (Alternative 3) is ranked as the best overall OE response action alternative for Area J due to the high OE hazard level and the current use of this area by the local community. The Subsurface Clearance of OE to Depth of Detection (Alternative 4) is ranked 2 (second best), based on cost and implementability issues. Institutional Controls (Alternative 2), because it would not be accepted by local agencies or the community as an acceptable or appropriate OE response action alternative in this area, is ranked 3 (last). Specific recommendations for Area J are made in Chapter 9.0, Recommended OE Response Action Alternatives.

8.2.5 Area K

The overall OE hazard level in this area is low (see Figure 8-1), based on the results of the Phase II EE/CA field investigation and evaluation of the three risk factors (OE Type, Site Characteristics, and Site Demographics) defined in the qualitative risk assessment (Chapter 4.0). Using this information, the four OE response action alternatives, evaluated in this EE/CA report, are comparatively analyzed in the following subsections to determine the most appropriate OE response action alternatives for Area K.

8.2.5.1 Effectiveness.

Table 8-42 provides the effectiveness criteria of the four alternatives for Area K. The evaluation of each of these alternatives is presented below.

Table 8-42. Effectiveness Criteria Evaluation for Area K

	Effectiveness					
Alternative	Protection of Human Safety	Compliance with ARARs	Long Term	Short Term	Score	Rank
1, No Action Indicated (NAI)	4	1	4	1	10	3
2, Institutional Controls	1	1	1	2	5	1
3, Surface Clearance	2	1	2	3	8	2
4, Subsurface Clearance to Depth	3	1	3	4	11	4

Note: Ranking from best to worst; best = 1.
ARAR = applicable or relevant and appropriate requirement

Protection of Human Safety. Although the OE hazard level in this area is low, there will always be a residual risk associated with OE at the former maneuver area, based on past military use of the site; therefore, institutional controls, because of its ability to educate the public concerning the risk associated with OE, is ranked 1 (best) for protection of human safety. Because the OE hazard level in this area is low, there is essentially little to be gained with regard to protection of human safety by performing a surface clearance or a subsurface clearance to depth of detection in this area; therefore, the surface clearance is ranked 2 (second best) and the subsurface clearance to depth of detection is ranked 3 (third best). NAI is ranked 4 (last) because it would do nothing to protect human safety, even in an area with only a residual risk.

Compliance with ARARs. Compliance with ARARs has been ranked equally among alternatives 1 through 4, as full compliance with the ARARs is expected with minimal impact to the environment.

Long-term Effectiveness. Institutional controls, in an area with a low OE hazard level, would be the most effective alternative over the long term because it would educate and inform the public concerning the residual risk associated with OE in this area. Because the OE hazard level in this area is low, there is essentially little to be gained in terms of effectiveness over the long term by performing a surface clearance or a subsurface clearance to depth of detection; therefore, the surface clearance is ranked 2 (second best) and the subsurface clearance to depth of detection is ranked 3 (third best). NAI is ranked 4 (last) because it would not be an effective risk reduction measure over the long term.

Short-term Effectiveness. Since the OE hazard level in this area is low, NAI would be the most effective alternative over the short term. Institutional controls is ranked 2 (second best) for short-term effectiveness because it would require an extended effort and additional time to coordinate with landowners and local agencies for implementation. The level of short-term effectiveness gained from a surface clearance or subsurface clearance to depth of detection is relatively lower than the effectiveness of NAI or institutional controls because the OE hazard level is already low; therefore, surface clearance is ranked 3 (third best) and subsurface clearance to depth of detection is ranked 4 (last).

8.2.5.2 Overall Effectiveness Ranking for Alternatives 1 through 4.

Institutional Controls (Alternative 2) is ranked as the most effective OE response action alternative because the OE hazard level is this area is already low. Surface Clearance of OE (Alternative 3) is ranked 2 (second best) and NAI (Alternative 1) is ranked 3 (third best). Because the OE hazard level in this area is already low, there would be minimal effectiveness in performing a subsurface clearance; therefore, Subsurface Clearance of OE to Depth of Detection (Alternative 4) is ranked 4 (last) in terms of effectiveness.

8.2.5.3 Implementability.

Table 8-43 provides the implementability criteria of the four alternatives for Area K. The evaluation of each of these alternatives is presented below.

Table 8-43. Implementability Criteria Evaluation for Area K

Alternative	Implementability					Score	Rank
	Technical Feasibility	Administrative Feasibility	Services and Materials	Local Agency Acceptance	Community Acceptance		
1, No Action Indicated (NAI)	1	1	1	4	4	11	2
2, Institutional Controls	4	4	2	3	2	15	3
3, Surface Clearance	2	2	3	1	1	9	1
4, Subsurface Clearance to Depth	3	3	4	2	3	15	3

Note: Ranking from best to worst; best = 1.

Technical and Administrative Feasibility. Implementing the NAI alternative would be easier than implementing any of the other alternatives, from both an administrative and a technical feasibility perspective, as no effort, materials, or services would be required. Therefore, NAI is ranked 1 (best) for technical and administrative feasibility.

Implementing institutional controls would require more logistical and management support than a clearance action because the process must be conducted in close coordination with local agencies, landowners, and the community. Although the supplies and personnel needed to construct display cases, install warning signs, conduct educational programs, and implement and oversee use restrictions are readily available, the length of time necessary to identify landowners and coordinate the implementation of institutional controls with landowners would be much greater than the relatively short length of time required to implement a clearance action. Therefore, institutional controls is ranked 4 (last) from a technical and administrative feasibility standpoint.

Implementation of a surface clearance would be quite feasible from a technical and administrative perspective. While relatively easier to implement than institutional controls or the subsurface clearance to depth of detection, the surface clearance would require more effort to implement than NAI (which requires no effort). Therefore, surface clearance is ranked 2 (second best) for technical and administrative feasibility.

From technical and administrative perspectives, implementation of a subsurface clearance to depth of detection is quite feasible. This alternative generally requires less logistical and management support than institutional controls, but requires more logistical and management support than a surface clearance or NAI. Unlike a surface clearance, a subsurface clearance to depth of detection requires excavation equipment (in addition to specially trained and qualified personnel and a means of OE disposal, which is required for all clearance actions). Therefore, subsurface clearance to depth of detection is ranked 3 (third best) in terms of technical and administrative feasibility, as it would take more time and effort to implement than a surface clearance or NAI, but less time and effort to implement than institutional controls.

Services and Materials. NAI is ranked 1 (best) for services and materials, as no effort, materials, or services would be required. Institutional controls is ranked 2 (second best) because the supplies and personnel needed to construct display

cases, install warning signs, conduct educational programs, and implement and oversee use restrictions are readily available. Surface clearance is ranked 3 (third best) because it would require specially trained and qualified personnel as well as the means of disposing of any encountered OE. Unlike a surface clearance, implementation of a subsurface clearance to depth of detection requires excavation equipment (in addition to specially trained and qualified personnel and a means of OE disposal, which is required for all clearance actions). Therefore, subsurface clearance to depth of detection is ranked 4 (last) for availability of services and materials.

Local Agency Acceptance. Based on interaction with agency representatives to date, it has been determined that local agencies are likely to consider a surface clearance as the most acceptable alternative, based on the land use in this area; therefore, surface clearance is ranked 1 (best) in terms of local agency acceptance. Local agencies would be more likely to consider a subsurface clearance to depth of detection in Area K over institutional controls or NAI, due to the OE scrap that was recovered in this area during the Phase II EE/CA field investigation and the current and future land use associated with this area; therefore, subsurface clearance to depth of detection is ranked 2 (second best), institutional controls is ranked 3 (third best), and NAI is ranked 4 (last).

Community Acceptance. Based on interaction with the community during the EE/CA investigation and during RAB meetings, the community is likely to consider a surface clearance as the most acceptable alternative based on the OE scrap recovered in this area during the Phase II EE/CA field investigation; therefore, surface clearance is ranked 1 (best) in terms of community acceptance. The community would be more likely to consider institutional controls in Area K over a subsurface clearance to depth of detection or NAI, due to the low OE hazard level in this area; therefore, institutional controls is ranked 2 (second best), subsurface clearance to depth of detection is ranked 3 (third best), and NAI is ranked 4 (last).

8.2.5.4 Overall Implementability Ranking for Alternatives 1 through 4.

Surface Clearance of OE (Alternative 3) is ranked as the best overall OE response action alternative in terms of implementability for Area K (see Table 8-43), based upon the land use for this area. NAI (Alternative 1) is ranked 2 (second best), based on technical and administrative feasibility and the ease with which it can be implemented. Institutional Controls (Alternative 2) and Subsurface Clearance of OE to Depth of Detection (Alternative 3) are ranked 3 (third best), based on technical and administrative feasibility issues and the lack of immediate availability of services and materials.

8.2.5.5 Cost.

Table 8-44 provides the cost criteria of the four alternatives for Area K. The evaluation of each of these alternatives is presented below.

Table 8-44. Cost Criteria Evaluation for Area K

Alternative	Cost	Investment	Benefit	Score	Rank
1, No Action Indicated (NAI)	$0	1	2	3	1
2, Institutional Controls	$974,920	2	1	3	1
3, Surface Clearance	$6,317,475	3	3	6	3
4, Subsurface Clearance to Depth	$63,458,060	4	4	8	4

Note: Ranking from best to worst; best = 1.

Investment and Benefit. There is no cost associated with NAI; therefore, NAI is ranked 1 (best) in terms of investment. The alternative that provides the greatest benefit, in terms of dollars spent to effect results, appears to be institutional controls. Although the OE hazard level in this area is low, it would be beneficial to inform and educate the public concerning the dangers associated with ordnance.

Because the OE hazard level is already low, there would be minimal (if any) risk reduction benefits that could be gained by performing a surface clearance or a subsurface clearance to depth of detection.

8.2.5.6 Overall Cost Ranking for Alternatives 1 through 4.

NAI (Alternative 1) and Institutional Controls (Alternative 2) are both ranked as the best overall alternative in terms of cost for Area K. The OE hazard level in this area is already low; therefore, NAI and institutional controls are tied as the most cost-effective alternatives. Because the OE hazard level in this area is already low, very little benefit would be gained by implementing Surface Clearance of OE (Alternative 3) or Subsurface Clearance of OE to Depth of Detection (Alternative 4).

8.2.5.7 Overall Ranking of Alternatives for Area K.

The overall ranking of the different alternatives in terms of their effectiveness, implementability, and cost is presented in Table 8-45. The alternative with the lowest score is considered best for each criterion (effectiveness, implementability, and cost) evaluated.

Table 8-45. Alternative Evaluation for Area K

Alternative	Effectiveness Rank	Implementability Rank	Cost Rank	Overall Score	Overall Rank
1, No Action Indicated (NAI)	3	2	1	6	2
2, Institutional Controls	1	3	1	5	1
3, Surface Clearance	2	1	3	6	2
4, Subsurface Clearance to Depth	4	3	4	11	4

Note: Ranking from best to worst; best = 1.

Because the OE hazard level in Area K is low, Institutional Controls (Alternative 2) is ranked as the best overall OE response action alternative. Very little benefit would be gained by conducting extensive risk reduction efforts in an area where the OE hazard level is already low; therefore, Surface Clearance of OE (Alternative 3) and NAI (Alternative 1) are both ranked 2 (second best). The Subsurface Clearance of OE to Depth of Detection (Alternative 4) is ranked 4 (last), based on cost benefit and implementability issues. Specific recommendations for Area K are made in Chapter 9.0, Recommended OE Response Action Alternatives.

8.3 GROUP III LAND USE

8.3.1 Area L

The overall OE hazard level in this area is low (see Figure 8-1), based on the results of the Phase II EE/CA field investigation and evaluation of the three risk factors (OE Type, Site Characteristics, and Site Demographics) defined in the qualitative risk assessment (Chapter 4.0). Using this information, the four OE response action alternatives evaluated in this EE/CA report are comparatively analyzed in the following subsections to determine the most appropriate OE response action alternatives for Area L.

8.3.1.1 Effectiveness.

Table 8-46 provides the effectiveness criteria of the four alternatives for Area L. The evaluation of each of these alternatives is presented below.

Table 8-46. Effectiveness Criteria Evaluation for Area L

	Effectiveness					
Alternative	Protection of Human Safety	Compliance with ARARs	Long Term	Short Term	Score	Rank
1, No Action Indicated (NAI)	4	1	4	1	10	3
2, Institutional Controls	1	1	1	2	5	1
3, Surface Clearance	2	1	2	3	8	2
4, Subsurface Clearance to Depth	3	1	3	4	11	4

Note: Ranking from best to worst; best = 1.
ARAR = applicable or relevant and appropriate requirement

Protection of Human Safety. Although the OE hazard level in this area is low, there will always be a residual risk associated with OE at the former maneuver area based on past military use of the site; therefore, institutional controls, because of its ability to educate the public concerning the risk associated with OE, is ranked 1 (best) for protection of human safety. Because the OE hazard level in this area is low, there is essentially little to be gained with regard to protection of human safety by performing a surface clearance or subsurface clearance to depth of detection in this area; therefore, surface clearance is ranked 2 (second best) and subsurface clearance to depth of detection is ranked 3 (third best). NAI is ranked 4 (last) because it would do nothing to protect human safety, even in an area with only a residual risk.

Compliance with ARARs. Compliance with ARARs has been ranked equally among Alternatives 1 through 4, as full compliance with the ARARs is expected with minimal impact to the environment.

Long-term Effectiveness. Institutional controls, in an area with a low OE hazard level, would be the most effective alternative over the long-term because it would educate and inform the public concerning the residual risk associated with OE in this area. Because the OE hazard level in this area is low, there is essentially little to be gained in terms of effectiveness over the long term by performing a surface clearance or subsurface clearance to depth of detection; therefore, surface clearance is ranked 2 (second best) and subsurface clearance to depth of detection is ranked 3 (third best). NAI is ranked 4 (last) because it would not be an effective risk reduction measure over the long term.

Short-term Effectiveness. Since the OE hazard level in this area is low, NAI would be the most effective alternative over the short term. Institutional controls is ranked 2 (second best) for short-term effectiveness because it would require an extended effort and additional time to coordinate with landowners and local agencies for implementation. The level of short-term effectiveness gained from a surface clearance or subsurface clearance to depth of detection is relatively lower than the effectiveness of NAI or institutional controls because the OE hazard level is already low; therefore, surface clearance is ranked 3 (third best) and subsurface clearance to depth of detection is ranked 4 (last).

8.3.1.2 Overall Effectiveness Ranking for Alternatives 1 through 4.

Institutional Controls (Alternative 2) is ranked as the most effective OE response action alternative because the OE hazard level is this area is already low. Surface Clearance of OE (Alternative 3) is ranked 2 (second best) and NAI (Alternative 1) is ranked 3 (third best). Because the OE hazard level in this area is already low, there would be minimal effectiveness in performing a subsurface clearance to depth of detection; therefore, Subsurface Clearance of OE to Depth of Detection (Alternative 4) is ranked 4 (last) in terms of effectiveness.

8.3.1.3 Implementability.

Table 8-47 provides the implementability criteria of the four alternatives for Area L. The evaluation of each of these alternatives is presented below.

Table 8-47. Implementability Criteria Evaluation for Area L

	Implementability						
Alternative	Technical Feasibility	Administrative Feasibility	Services and Materials	Local Agency Acceptance	Community Acceptance	Score	Rank
1, No Action Indicated (NAI)	1	1	1	4	4	11	2
2, Institutional Controls	4	4	2	3	3	16	4
3, Surface Clearance	2	2	3	2	1	10	1
4, Subsurface Clearance to Depth	3	3	4	1	2	13	3

Note: Ranking from best to worst; best = 1.

Technical and Administrative Feasibility. Implementing the NAI alternative would be easier than implementing any of the other alternatives, from both an administrative and a technical feasibility perspective, as no effort, materials, or services would be required. Therefore, NAI is ranked 1 (best) for technical and administrative feasibility.

Implementing institutional controls would require more logistical and management support than a clearance action because the process must be conducted in close coordination with local agencies, landowners, and the community. Although the supplies and personnel needed to construct display cases, install warning signs, conduct educational programs, and implement and oversee use restrictions are readily available, the length of time necessary to identify landowners and coordinate the implementation of institutional controls with landowners would be much greater than the relatively short length of time required to implement a clearance action. Therefore, institutional controls is ranked 4 (last) from a technical and administrative feasibility standpoint.

Implementation of a surface clearance would be quite feasible from a technical and administrative perspective. While relatively easier to implement than institutional controls or a subsurface clearance to depth of detection, surface clearance would require more effort to implement than NAI (which requires no effort). Therefore, surface clearance is ranked 2 (second best) for technical and administrative feasibility.

From technical and administrative perspectives, implementation of a subsurface clearance to depth of detection is quite feasible. This alternative generally requires less logistical and management support than institutional controls, but requires more logistical and management support than a surface clearance or NAI. Unlike a surface clearance, a subsurface clearance to depth of detection requires excavation equipment (in addition to specially trained and qualified personnel and a means of OE disposal, which is required for all clearance actions). Therefore, subsurface clearance to depth of detection is ranked 3 (third best) in terms of technical and administrative feasibility, as it would take more time and effort to implement than a surface clearance or NAI, but less time and effort to implement than institutional controls.

Services and Materials. NAI is ranked 1 (best) for services and materials, as no effort, materials, or services would be required. Institutional controls is ranked 2 (second best) because the supplies and personnel needed to construct display cases, install warning signs, conduct educational programs, and implement and oversee use restrictions are readily available. Surface clearance is ranked 3 (third best) because it would require specially trained and qualified personnel as well as the means of disposing of any encountered OE. Unlike a surface clearance, implementation of a subsurface clearance to depth of detection requires excavation equipment (in addition to specially trained and qualified personnel and a means of OE disposal, which is required for all clearance actions). Therefore, subsurface clearance to depth of detection is ranked 4 (last) for availability of services and materials.

Local Agency Acceptance. Based on interaction with agency representatives to date, it has been determined that local agencies are likely to consider a subsurface clearance to depth of detection as the most acceptable alternative in this area, based on the OE scrap recovered in this area and the projected plans for future development of Area L; therefore, subsurface clearance to depth of detection is ranked 1 (best) in terms of local agency acceptance. Local agencies are more likely to consider a surface clearance or institutional controls over NAI due to the projected future land use for this area. Therefore, surface clearance is ranked 2 (second best) and institutional controls is ranked 3 (third best). NAI is ranked 4 (last) in terms of local agency acceptance.

Community Acceptance. Based on interaction with the community during the EE/CA investigation and during RAB meetings, the community is likely to consider a surface clearance as the most acceptable alternative based on the OE scrap recovered on the surface in this area; therefore, surface clearance is ranked 1 (best) in terms of community acceptance. The community is more likely to consider a subsurface clearance to depth of detection or institutional controls over NAI due to the projected future land use for this area. Therefore, subsurface clearance to depth of detection is ranked 2 (second best) and institutional controls is ranked 3 (third best). NAI is ranked 4 (last) in terms of community acceptance.

8.3.1.4 Overall Implementability Ranking for Alternatives 1 through 4.

Surface Clearance of OE (Alternative 3) is ranked as the best overall OE response action alternative in terms of implementability for Area L (see Table 8-47), based upon the planned future development for this area and its acceptance by local agencies and the community. NAI (Alternative 1) is ranked 2 (second best), based on technical and administrative feasibility issues. Subsurface Clearance of OE to Depth of Detection (Alternative 4) is ranked 3 (third best), based on technical and administrative feasibility issues and the lack of immediate availability of services and materials. Institutional Controls (Alternative 2) is ranked 4 (last), based on technical and administrative feasibility issues and the lack of acceptance of this alternative by local agencies and the community.

8.3.1.5 Cost.

Table 8-48 provides the cost criteria of the four alternatives for Area L. The evaluation of each of these alternatives is presented below.

Table 8-48. Cost Criteria Evaluation for Area L

Alternative	Cost	Investment	Benefit	Score	Rank
1, No Action Indicated (NAI)	$0	1	2	3	1
2, Institutional Controls	$512,031	2	1	3	1
3, Surface Clearance	$3,492,375	3	3	6	3
4, Subsurface Clearance to Depth	$33,277,292	4	4	8	4

Note: Ranking from best to worst; best = 1.

Investment and Benefit. There is no cost associated with NAI; therefore, NAI is ranked 1 (best) in terms of investment. The alternative that provides the greatest benefit, in terms of dollars spent to effect results, appears to be institutional controls. Although the OE hazard level in this area is low, it would be beneficial to inform and educate the public concerning the dangers associated with ordnance. Because the OE hazard level is already low, there would be minimal (if any) risk reduction benefits that could be gained by performing a surface clearance or a subsurface clearance to depth of detection.

8.3.1.6 Overall Cost Ranking for Alternatives 1 through 4.

NAI (Alternative 1) and Institutional Controls (Alternative 2) are both ranked as the best overall alternatives in terms of cost for Area L. The OE hazard level in this area is already low; therefore, NAI and institutional controls are tied as the most cost-effective alternatives. Because the OE hazard level in this area is already low, very little benefit would be gained by implementing Surface Clearance of OE (Alternative 3) or Subsurface Clearance of OE to Depth of Detection (Alternative 4).

8.3.1.7 Overall Ranking of Alternatives for Area L.

The overall ranking of the different alternatives in terms of their effectiveness, implementability, and cost is presented in Table 8-49. The alternative with the lowest score is considered best for each criterion (effectiveness, implementability, and cost) evaluated.

Table 8-49. Alternative Evaluation for Area L

Alternative	Effectiveness Rank	Implementability Rank	Cost Rank	Overall Score	Overall Rank
1, No Action Indicated (NAI)	3	2	1	6	1
2, Institutional Controls	1	4	1	6	1
3, Surface Clearance	2	1	3	6	1
4, Subsurface Clearance to Depth	4	3	4	11	4

Note: Ranking from best to worst; best = 1.

Because the OE hazard level in Area L is low and there is a potential for future development, NAI (Alternative 1), Institutional Controls (Alternative 2), and Surface Clearance of OE (Alternative 3) are all ranked equally as the best overall OE response action alternatives. Very little benefit would be gained by conducting extensive risk reduction efforts in an area where the OE hazard is already low; therefore, Subsurface Clearance of OE to Depth of Detection (Alternative 4) is ranked 4 (last). Specific recommendations for Area L are made in Chapter 9.0, Recommended OE Response Action Alternatives.

8.3.2 Area M

The overall OE hazard level in this area is high (see Figure 8-1), based on the results of the Phase II EE/CA field investigation and evaluation of the three risk

factors (OE Type, Site Characteristics, and Site Demographics) defined in the qualitative risk assessment (Chapter 4.0). Using this information, the four OE response action alternatives evaluated in this EE/CA report are comparatively analyzed in the following subsections to determine the most appropriate OE response action alternatives for Area M.

8.3.2.1 Effectiveness.

Table 8-50 provides the effectiveness criteria of the four alternatives for Area M. The evaluation of each of these alternatives is presented below.

Table 8-50. Effectiveness Criteria Evaluation for Area M

	Effectiveness					
Alternative	Protection of Human Safety	Compliance with ARARs	Long Term	Short Term	Score	Rank
1, No Action Indicated (NAI)	NA	NC	NC	NC	NC	NC
2, Institutional Controls	3	1	3	3	10	3
3, Surface Clearance	2	1	2	1	6	2
4, Subsurface Clearance to Depth	1	1	1	2	5	1

Note: Ranking from best to worst; best = 1.
ARAR = applicable or relevant and appropriate requirement
NA = not applicable
NC = not considered

Protection of Human Safety. NAI is considered an unacceptable OE response action alternative for Area M because it does not meet the minimum threshold criterion for the protection of human safety; therefore, NAI is not evaluated further as an acceptable OE response action alternative for Area M. Institutional controls is ranked 3 (third best) for protection of human safety because it does not involve the removal of OE and is therefore less protective of human safety in an area with a high OE hazard level than surface clearance or subsurface clearance to depth of detection. Surface clearance is ranked 2 (second best) and subsurface clearance to depth of detection is ranked 1 (best) for protection of human safety, based upon their ability to provide the greatest reduction in risk associated with the high OE hazard level in this area.

Compliance with ARARs. Compliance with ARARs has been ranked equally among alternatives 2 through 4, as full compliance with the ARARs is expected with minimal impact to the environment.

Long-term Effectiveness. Institutional controls is ranked 3 (last) because it would not be effective over the long term in reducing the risk associated with the high OE hazard level in Area M. Surface clearance is ranked 2 (second best) as it would be more effective over the long term than institutional controls, but less effective over the long term than a subsurface clearance to depth of detection. Subsurface clearance to depth of detection is ranked 1 (best) because it would provide the maximum protection of human safety and would be the most effective OE response action alternative over the long term.

Short-term Effectiveness. Institutional controls is ranked 3 (last) for short-term effectiveness because of the length of time necessary to implement the alternative to the point that it affords protection. The time involved includes identifying landowners and responsible agencies, meeting with landowners and local agencies to confirm the location of display cases and warning signs, and coordination of the distribution of informational pamphlets and establishment of local community awareness meetings. Surface clearance is ranked 1 (best) for short term effectiveness, as it would take less time to implement and would be more effective over the short term than institutional controls or a subsurface clearance to depth of detection. Subsurface clearance to depth of detection ranked 2 (second best) for short-term effectiveness, as it would take significantly more time to implement than a surface clearance, but less time to implement than institutional controls.

8.3.2.2 Overall Effectiveness Ranking for Alternatives 1 through 4.

Subsurface Clearance of OE to Depth of Detection (Alternative 4) is ranked as the best overall alternative in terms of effectiveness for Area M (see Table 8-50), based upon its ability to reduce the risk associated with the high OE hazard level in this area and because it provides the most effective protection to the public from OE. Surface Clearance of OE (Alternative 3) is ranked 2 (second best) because it would not offer the most effective protection to the public and would not be the most effective OE response action alternative over the long term. Institutional Controls (Alternative 2) is ranked 3 (last) because it would take too much time to coordinate with landowners and local agencies and would not be effective as a stand alone alternative in an area with a high OE hazard level.

8.3.2.3 Implementability.

Table 8-51 provides the implementability criteria of the four alternatives for Area M. The evaluation of each of these alternatives is presented below.

Table 8-51. Implementability Criteria Evaluation for Area M

	Implementability						
Alternative	Technical Feasibility	Administrative Feasibility	Services and Materials	Local Agency Acceptance	Community Acceptance	Score	Rank
2, Institutional Controls	3	3	1	3	3	13	3
3, Surface Clearance	1	1	2	2	2	8	1
4, Subsurface Clearance to Depth	2	2	3	1	1	9	2

Note: Ranking from best to worst; best = 1.

Technical and Administrative Feasibility. Implementing the institutional controls alternative would require more logistical and management support than a clearance action because the process must be conducted in close coordination with local agencies and the community. Although the supplies and personnel needed to construct display cases, install warning signs, conduct educational programs, and implement and oversee use restrictions are readily available; the

length of time necessary to identify landowners and coordinate the implementation of institutional controls with landowners would be much greater than the relatively short length of time required to implement a clearance action. Therefore, institutional controls is ranked 3 (last) from a technical and administrative feasibility standpoint.

Implementation of a surface clearance would be quite feasible from a technical and administrative perspective. Surface clearance would be relatively easier to implement than institutional controls or subsurface clearance to depth of detection. Therefore, surface clearance is ranked 1 (best) for technical and administrative feasibility.

From technical and administrative perspectives, implementation of a subsurface clearance to depth of detection is quite feasible. This alternative generally requires less logistical and management support than institutional controls, but requires more logistical and management support than a surface clearance. Unlike a surface clearance, a subsurface clearance requires excavation equipment (in addition to specially trained and qualified personnel and a means of OE disposal, which is required for all clearance actions). Therefore, the subsurface clearance to depth of detection is ranked 2 (second best) in terms of technical and administrative feasibility, as it would take more time and effort to implement than the surface clearance, but less time and effort to implement than institutional controls.

Services and Materials. Institutional controls is ranked 1 (best) because the supplies and personnel needed to construct and install display cases and warning signs, conduct educational programs, and implement and oversee use restrictions are readily available. Surface clearance is ranked 2 (second best) because it would require specially trained and qualified personnel as well as the means of disposing of any encountered OE. Unlike a surface clearance, implementation of a subsurface clearance to depth of detection requires excavation equipment (in addition to specially trained and qualified personnel and a means of OE disposal). Therefore, this alternative is ranked 3 (last) for availability of services and materials.

Local Agency Acceptance. Based on interaction with agency representatives to date, it has been determined that local agencies are likely to consider subsurface clearance to depth of detection as the most appropriate and acceptable alternative for Area M, based on the high OE hazard level and that the area is easily accessible. Surface clearance is ranked 2 (second best) and institutional controls is ranked 3 (last).

Community Acceptance. Based on interaction with the community during the EE/CA investigation and during RAB meetings, the community is likely to consider subsurface clearance to depth of detection as the most appropriate and acceptable alternative for Area M, based on the high OE hazard level and that the area is easily accessible by the local community. Surface clearance, because it would only remove OE (if present) from the surface, is ranked 2 (second best). Institutional controls alone would not reduce the OE hazard level in this area and would not be an effective alternative unless it is implemented in

conjunction with a clearance action; therefore, institutional controls is ranked 3 (last) for Area M.

8.3.2.4 Overall Implementability Ranking for Alternatives 1 through 4.

Surface Clearance of OE (Alternative 3) is ranked as the best overall alternative in terms of implementability for Area M (see Table 8-51) due to the high OE hazard level and that the area is easily accessible by the local community. Subsurface Clearance of OE to Depth of Detection (Alternative 4) is ranked 2 (second best) based on implementability issues. Institutional Controls (Alternative 2) is ranked 3 (last) because it would not be considered as an acceptable stand-alone alternative to local agencies and the community, as it does not involve the removal of OE.

8.3.2.5 Cost.

Table 8-52 provides the cost criteria of the four alternatives for Area M. The evaluation of each of these alternatives is presented below.

Table 8-52. Cost Criteria Evaluation for Area M

Alternative	Cost	Investment	Benefit	Score	Rank
2, Institutional Controls	$870,119	1	3	4	2
3, Surface Clearance	$5,743,680	2	1	3	1
4, Subsurface Clearance to Depth	$56,766,980	3	2	5	3

Note: Ranking from best to worst; best = 1.

Investment and Benefit. There are minimal costs associated with institutional controls; therefore, institutional controls is ranked 1 (best) in terms of investment. The alternative that provides the greatest benefit, in terms of dollars spent to effect results, appears to be the surface clearance, followed by the subsurface clearance to depth of detection and institutional controls. The cost of implementing institutional controls is lower than that of any clearance alternative; however, the benefit of implementation in protecting human safety would be much lower than the benefit of either the surface or subsurface clearance actions.

8.3.2.6 Overall Cost Ranking for Alternatives 1 through 4.

Surface Clearance of OE (Alternative 3) is ranked as the best OE response action alternative in terms of cost for Area M (see Table 8-52), based upon its ability to reduce the OE hazard level and potential for exposure to OE in this area for dollars spent to effect results. Institutional Controls (Alternative 2) is ranked 2 (second best) because it has the ability to reduce the OE hazard level in this area and the benefit of implementation could be similar to that of a surface clearance, depending on local agency and community support and involvement. The Subsurface Clearance of OE to Depth of Detection (Alternative 4) is ranked 3 (last), based on cost.

8.3.2.7 Overall Ranking of Alternatives for Area M.

The overall ranking of the different alternatives in terms of their effectiveness, implementability, and cost is presented in Table 8-53. The alternative with the lowest score is considered best for each criterion (effectiveness, implementability, and cost) evaluated.

Table 8-53. Alternative Evaluation for Area M

Alternative	Effectiveness Rank	Implementability Rank	Cost Rank	Overall Score	Overall Rank
2, Institutional Controls	3	3	2	8	3
3, Surface Clearance	2	1	1	4	1
4, Subsurface Clearance to Depth	1	2	3	6	2

Note: Ranking from best to worst; best = 1.

Surface Clearance of OE (Alternative 3) is ranked as the best overall OE response action alternative for Area M due to the high OE hazard level in this area, the current use of this area by the local community, and the construction for future expansion that is currently underway. Subsurface Clearance of OE to Depth of Detection (Alternative 4) is ranked 2 (second best), based on cost and implementability issues. Institutional Controls (Alternative 2), because it would not be accepted by local agencies or the community as an acceptable or appropriate alternative in this area, is ranked 3 (last). Specific recommendations for Area M are made in Chapter 9.0, Recommended OE Response Action Alternatives.

8.3.3 Area N

The overall OE hazard level in this area is moderate (see Figure 8-1), based on the results of the Phase II EE/CA field investigation and evaluation of the three risk factors (OE Type, Site Characteristics, and Site Demographics) defined in the qualitative risk assessment (Chapter 4.0). Using this information, the four OE response action alternatives evaluated in this EE/CA report are comparatively analyzed in the following subsections to determine the most appropriate OE response action alternatives for Area N.

8.3.3.1 Effectiveness.

Table 8-54 provides the effectiveness criteria of the four alternatives for Area N. The evaluation of each of these alternatives is presented below.

Protection of Human Safety. If the NAI alternative were implemented, the potential for exposure to OE would remain unchanged; therefore, NAI is ranked 4 (last) for protection of human safety. Institutional controls is ranked 3 (third best) for protection of human safety because it would not involve the removal of ordnance in an area with a moderate OE hazard level and would, therefore, not be the most effective in protecting human safety. Surface clearance would reduce the potential for exposure to OE in this area; therefore, surface clearance is ranked 2

Table 8-54. Effectiveness Criteria Evaluation for Area N

Alternative	Effectiveness: Protection of Human Safety	Effectiveness: Compliance with ARARs	Effectiveness: Long Term	Effectiveness: Short Term	Score	Rank
1, No Action Indicated (NAI)	4	1	4	4	13	4
2, Institutional Controls	3	1	3	3	10	3
3, Surface Clearance	2	1	2	1	6	2
4, Subsurface Clearance to Depth	1	1	1	2	5	1

Note: Ranking from best to worst; best = 1.
ARAR = applicable or relevant and appropriate requirement

(second best) in terms of protection of human safety. Subsurface clearance to depth of detection is ranked 1 (best) because it would offer the greatest reduction in exposure to OE and provide the maximum protection of human safety in an area with a moderate OE hazard level.

Compliance with ARARs. Compliance with ARARs has been ranked equally among Alternatives 1 through 4, as full compliance with the ARARs is expected with minimal impact to the environment.

Long-term Effectiveness. NAI is ranked 4 (last) in terms of long-term effectiveness because it would offer no reduction in risk over the long term. Institutional controls is ranked 3 (third best) because it would not be effective over the long term in reducing the risk associated with the moderate OE hazard level in Area N. Surface clearance is ranked 2 (second best), as it would be more effective over the long term than institutional controls, but less effective over the long term than a subsurface clearance to depth of detection. Subsurface clearance to depth of detection is ranked 1 (best) because it would provide the maximum protection of human safety and would be the most effective OE response action alternative over the long term.

Short-term Effectiveness. NAI is ranked 4 (last) in terms of short-term effectiveness because it would offer no reduction in risk over the short term. Institutional controls is ranked 3 (third best) for short-term effectiveness because of the length of time necessary to implement the alternative to the point that it affords protection. The time involved with implementation of institutional controls includes identifying landowners and responsible agencies, meeting with landowners and local agencies to confirm the location of display cases and warning signs, and coordination of the distribution of informational pamphlets and establishment of local community awareness meetings. Surface clearance is ranked 1 (best) for short-term effectiveness, as it would take less time to implement and would be more effective over the short term than institutional controls or a subsurface clearance to depth of detection. Subsurface clearance to depth of detection is ranked 2 (second best) for short-term effectiveness, as it would take significantly more time to implement than a surface clearance, but less time to implement than institutional controls.

8.3.3.2 Overall Effectiveness Ranking for Alternatives 1 through 4.

Subsurface Clearance of OE to Depth of Detection (Alternative 4) is ranked as the best OE response action alternative in terms of effectiveness for Area N (see Table 8-54), based upon its ability to reduce the potential risk of OE exposure and provide the most effective protection to the public from OE. Surface Clearance of OE (Alternative 3) is ranked 2 (second best) and Institutional Controls (Alternative 2) is ranked 3 (third best) because both would offer less protection to the public in an area with a moderate OE hazard level than the subsurface clearance to depth of detection. NAI (Alternative 1) is ranked 4 (last) because it would do nothing to protect human safety.

Table 8-55. Implementability Criteria Evaluation for Area N

	Implementability						
Alternative	Technical Feasibility	Administrative Feasibility	Services and Materials	Local Agency Acceptance	Community Acceptance	Score	Rank
1, No Action Indicated (NAI)	1	1	1	4	4	11	1
2, Institutional Controls	4	4	2	3	3	16	4
3, Surface Clearance	2	2	3	2	2	11	1
4, Subsurface Clearance to Depth	3	3	4	1	1	12	3

Note: Ranking from best to worst; best = 1.

8.3.3.3 Implementability.

Table 8-55 provides the implementability criteria of the four alternatives for Area N. The evaluation of each of these alternatives is presented below.

Technical and Administrative Feasibility. Implementing the NAI alternative would be easier than implementing any of the other alternatives, from both an administrative and a technical feasibility perspective, as no effort, materials, or services would be required. Therefore, NAI is ranked 1 (best) for technical and administrative feasibility.

Implementing institutional controls would require more logistical and management support than a clearance action because the process must be conducted in close coordination with local agencies, landowners, and the community. Although the supplies and personnel needed to construct display cases, install warning signs, conduct educational programs, and implement and oversee use restrictions are readily available, the length of time necessary to identify landowners and coordinate the implementation of institutional controls with landowners would be much greater than the relatively short length of time required to implement a clearance action. Therefore, institutional controls is ranked 4 (last) from a technical and administrative feasibility standpoint.

Implementation of a surface clearance would be quite feasible from a technical and administrative perspective. While relatively easier to implement than institutional controls or the subsurface clearance to depth of detection, the

surface clearance would require more effort to implement than NAI (which requires no effort). Therefore, surface clearance is ranked 2 (second best) for technical and administrative feasibility.

From technical and administrative perspectives, implementation of a subsurface clearance to depth of detection is quite feasible. This alternative generally requires less logistical and management support than institutional controls, but requires more logistical and management support than a surface clearance or NAI. Unlike a surface clearance, a subsurface clearance to depth of detection requires excavation equipment (in addition to specially trained and qualified personnel and a means of OE disposal, which is required for all clearance actions). Therefore, subsurface clearance to depth of detection is ranked 3 (third best) in terms of technical and administrative feasibility, as it would take more time and effort to implement than a surface clearance or NAI, but less time and effort to implement than institutional controls.

Services and Materials. NAI is ranked 1 (best) for services and materials, as no effort, materials, or services would be required. Institutional controls is ranked 2 (second best) because the supplies and personnel needed to construct display cases, install warning signs, conduct educational programs, and implement and oversee use restrictions are readily available. Surface clearance is ranked 3 (third best) because it would require specially trained and qualified personnel as well as the means of disposing of any encountered OE. Unlike a surface clearance, implementation of a subsurface clearance to depth of detection requires excavation equipment (in addition to specially trained and qualified personnel and a means of OE disposal, which is required for all clearance actions). Therefore, subsurface clearance to depth of detection is ranked 4 (last) for availability of services and materials.

Local Agency Acceptance. Based on interaction with agency representatives to date, it has been determined that local agencies are likely to consider a subsurface clearance to depth of detection as the most acceptable alternative, based on the moderate OE hazard level in Area N and that planned future development in this area is underway; therefore, subsurface clearance to depth of detection is ranked 1 (best) in terms of local agency acceptance. Local agencies would be more likely to consider a surface clearance over institutional controls or NAI, due to the UXO item that was found in the vicinity of this area during a previous investigation; therefore, surface clearance is ranked 2 (second best), institutional controls is ranked 3 (third best), and NAI is ranked 4 (last).

Community Acceptance. Based on interaction with the community during the Phase II EE/CA investigation and during RAB meetings, the community is likely to consider a subsurface clearance to depth of detection as the most acceptable alternative for Area N, based on the moderate OE hazard level, planned future development for this area (currently underway), and the accessibility of the area to the general public; therefore, subsurface clearance to depth of detection is ranked 1 (best) in terms of local agency acceptance. The community would be more likely to consider a surface clearance over institutional controls or NAI, due to the UXO item that was found in the vicinity of this area during a previous

investigation; therefore, surface clearance is ranked 2 (second best), institutional controls is ranked 3 (third best), and NAI is ranked 4 (last).

8.3.3.4 Overall Implementability Ranking for Alternatives 1 through 4.

Surface Clearance of OE (Alternative 3) and NAI (Alternative 1) are both ranked as the best overall OE response action alternatives in terms of implementability for Area N (see Table 8-55). Although NAI tied as the best alternative in terms of implementability, it is not considered by local agencies or the community as an acceptable or appropriate OE response action alternative for Area N, due to the moderate OE hazard level in this area. Subsurface Clearance of OE to Depth of Detection (Alternative 4) is ranked 3 (third best), based on technical and administrative feasibility issues and the lack of immediate availability of services and materials. Institutional Controls (Alternative 2) is ranked 4 (last) based on technical and administrative feasibility issues and its lack of acceptance by local agencies and the community as an effective stand-alone alternative.

8.3.3.5 Cost.

Table 8-56 provides the cost criteria of the four alternatives for Area N. Evaluation of each of these alternatives is presented below.

Table 8-56. Cost Criteria Evaluation for Area N

Alternative	Cost	Investment	Benefit	Score	Rank
1, No Action Indicated (NAI)	$0	1	4	5	3
2, Institutional Controls	$271,428	2	2	4	1
3, Surface Clearance	$4,897,675	3	1	4	1
4, Subsurface Clearance to Depth	$65,874,096	4	3	7	4

Note: Ranking from best to worst; best = 1.

Investment and Benefit. There is no cost associated with NAI; therefore, NAI is ranked 1 (best) in terms of investment. The alternative that provides the greatest benefit, in terms of dollars spent to effect results, appears to be the surface clearance. Institutional controls is ranked 2 (second best) because it offers the opportunity to educate the community concerning the danger associated with OE in this area and has the potential to offer a reduction in the potential for OE exposure similar to that of a surface clearance. Subsurface clearance to depth of detection is ranked 3 (third best), due to the cost. NAI is ranked 4 (last) because it would offer no benefit in terms of reduction of exposure to OE.

8.3.3.6 Overall Cost Ranking for Alternatives 1 through 4.

Institutional Controls (Alternative 2) and Surface Clearance of OE (Alternative 3) are both ranked as the most acceptable alternatives in terms of cost for Area N. Both of these alternatives offer the ability to reduce the potential for exposure to OE in terms of cost benefit and investment. NAI (Alternative 1) is ranked 3 (third best) because it would offer no reduction in the potential for exposure to OE. Subsurface Clearance of OE to Depth of Detection (Alternative 4) is ranked 4

(last) because the high cost of this alternative far outweighs the benefit in reduction to be gained as a result of implementation.

8.3.3.7 Overall Ranking of Alternatives for Area N.

The overall ranking of the different alternatives in terms of their effectiveness, implementability, and cost is presented in Table 8-57. The alternative with the lowest score is considered best for each criterion (effectiveness, implementability, and cost) evaluated.

Table 8-57. Alternative Evaluation for Area N

Alternative	Effectiveness Rank	Implementability Rank	Cost Rank	Overall Score	Overall Rank
1, No Action Indicated (NAI)	4	1	3	8	2
2, Institutional Controls	3	4	1	8	2
3, Surface Clearance	2	1	1	4	1
4, Subsurface Clearance to Depth	1	3	4	8	2

Note: Ranking from best to worst; best = 1.

Surface Clearance of OE (Alternative 3) is ranked as the best overall OE response action alternative for Area N due to the moderate OE hazard level in this area and that the area is accessible to the general public. NAI (Alternative 1), Institutional Controls (Alternative 2), and Subsurface Clearance of OE to Depth of Detection (Alternative 4) are all ranked behind the surface clearance. Specific recommendations for Area N are made in Chapter 9.0, Recommended OE Response Action Alternatives.

8.3.4 Area O

The overall OE hazard level in this area is high (see Figure 8-1), based on the results of the Phase II EE/CA field investigation and evaluation of the three risk factors (OE Type, Site Characteristics, and Site Demographics) defined in the qualitative risk assessment (Chapter 4.0). Using this information, the four OE response action alternatives evaluated in this EE/CA report are comparatively analyzed in the following subsections to determine the most appropriate OE response action alternatives for Area O.

8.3.4.1 Effectiveness.

Table 8-58 provides the effectiveness criteria of the four alternatives for Area O. The evaluation of each of these alternatives is presented below.

Protection of Human Safety. NAI is considered an unacceptable OE response action alternative for Area O because it does not meet the minimum threshold criterion for the protection of human safety; therefore, NAI is not evaluated further as an acceptable OE response action alternative for Area O. Institutional controls is ranked 3 (third best) for protection of human safety because it does not involve

Table 8-58. Effectiveness Criteria Evaluation for Area O

Alternative	Effectiveness: Protection of Human Safety	Effectiveness: Compliance with ARARs	Effectiveness: Long Term	Effectiveness: Short Term	Score	Rank
1, No Action Indicated (NAI)	NA	NC	NC	NC	NC	NC
2, Institutional Controls	3	1	3	3	10	3
3, Surface Clearance	2	1	2	1	6	2
4, Subsurface Clearance to Depth	1	1	1	2	5	1

Note: Ranking from best to worst; best = 1.
ARAR = applicable or relevant and appropriate requirement
NA = not applicable
NC = not considered

the removal of OE and is therefore less protective of human safety in an area with a high OE hazard level than the surface clearance or the subsurface clearance to depth of detection. Surface clearance is ranked 2 (second best) and subsurface clearance to depth of detection is ranked 1 (best) for protection of human safety based upon their ability to provide the greatest reduction in risk associated with the high OE hazard level in this area.

Compliance with ARARs. Compliance with ARARs has been ranked equally among Alternatives 2 through 4, as full compliance with the ARARs is expected with minimal impact to the environment.

Long-term Effectiveness. Institutional controls is ranked 3 (last) because it would not be effective over the long term in reducing the risk associated with the high OE hazard level in Area O. Surface clearance is ranked 2 (second best) as it would be more effective over the long term than institutional controls, but less effective over the long term than a subsurface clearance to depth of detection. Subsurface clearance to depth of detection is ranked 1 (best) because it would provide the maximum protection of human safety and would be the most effective OE response action alternative over the long term.

Short-term Effectiveness. Institutional controls is ranked 3 (last) for short-term effectiveness because of the length of time necessary to implement the alternative to the point that it affords protection. The time involved includes identifying landowners and responsible agencies, meeting with landowners and local agencies to confirm the location of display cases and warning signs, and coordination of the distribution of informational pamphlets and establishment of local community awareness meetings. Surface clearance is ranked 1 (best) for short-term effectiveness, as it would take less time to implement and would be more effective over the short term than institutional controls or a subsurface clearance to depth of detection. Subsurface clearance to depth of detection is ranked 2 (second best) for short-term effectiveness, as it would take significantly more time to implement than a surface clearance, but less time to implement than institutional controls.

8.3.4.2 Overall Effectiveness Ranking for Alternatives 1 through 4.

Subsurface Clearance of OE to Depth of Detection (Alternative 4) is ranked as the best overall alternative in terms of effectiveness for Area O (see Table 8-58), based upon its ability to reduce the risk associated with the high OE hazard level in this area and because it provides the most effective protection to the public from OE. Surface Clearance of OE (Alternative 3) is ranked 2 (second best) because it would not offer the most effective protection to the public and would not be the most effective OE response action alternative over the long term. Institutional Controls (Alternative 2) is ranked 3 (last) because it would take too much time to coordinate with landowners and local agencies and would not be effective as a stand alone alternative in an area with a high OE hazard level.

8.3.4.3 Implementability.

Table 8-59 provides the implementability criteria of the four alternatives for Area O. The evaluation of each of these alternatives is presented below.

Table 8-59. Implementability Criteria Evaluation for Area O

	Implementability						
Alternative	Technical Feasibility	Administrative Feasibility	Services and Materials	Local Agency Acceptance	Community Acceptance	Score	Rank
2, Institutional Controls	3	3	1	3	3	13	3
3, Surface Clearance	1	1	2	2	2	8	1
4, Subsurface Clearance to Depth	2	2	3	1	1	9	2

Note: Ranking from best to worst; best = 1.

Technical and Administrative Feasibility. Implementing the institutional controls alternative would require more logistical and management support than a clearance action because the process must be conducted in close coordination with local agencies and the community. Although the supplies and personnel needed to construct display cases, install warning signs, conduct educational programs, and implement and oversee use restrictions are readily available; the length of time necessary to identify landowners and coordinate the implementation of institutional controls with landowners would be much greater than the relatively short length of time required to implement a clearance action. Therefore, institutional controls is ranked 3 (last) from a technical and administrative feasibility standpoint.

Implementation of a surface clearance would be quite feasible from a technical and administrative perspective. Surface clearance would be relatively easier to implement than institutional controls or subsurface clearance to depth of detection. Therefore, surface clearance is ranked 1 (best) for technical and administrative feasibility.

From technical and administrative perspectives, implementation of a subsurface clearance to depth of detection is quite feasible. This alternative generally

requires less logistical and management support than institutional controls, but requires more logistical and management support than a surface clearance. Unlike a surface clearance, a subsurface clearance to depth of detection requires excavation equipment (in addition to specially trained and qualified personnel and a means of OE disposal, which is required for all clearance actions). Therefore, the subsurface clearance to depth of detection is ranked 2 (second best) in terms of technical and administrative feasibility, as it would take more time and effort to implement than the surface clearance, but less time and effort to implement than institutional controls.

Services and Materials. Institutional controls is ranked 1 (best) because the supplies and personnel needed to construct and install display cases and warning signs, conduct educational programs, and implement and oversee use restrictions are readily available. Surface clearance is ranked 2 (second best) because it would require specially trained and qualified personnel as well as the means of disposing of any encountered OE. Unlike a surface clearance, implementation of a subsurface clearance to depth of detection requires excavation equipment (in addition to specially trained and qualified personnel and a means of OE disposal, which is required for all clearance actions). Therefore, this alternative is ranked 3 (last) for availability of services and materials.

Local Agency Acceptance. Based on interaction with agency representatives to date, it has been determined that local agencies are likely to consider subsurface clearance to depth of detection as the most appropriate and acceptable alternative for Area O, based on the high OE hazard level and that the area is easily accessible. Surface clearance is ranked 2 (second best) and institutional controls is ranked 3 (last).

Community Acceptance. Based on interaction with the community during the EE/CA investigation and during RAB meetings, the community is likely to consider subsurface clearance to depth of detection as the most appropriate and acceptable alternative for Area O, based on the high OE hazard level and that the area is easily accessible by the local community. Surface clearance, because it would only remove OE (if present) from the surface, is ranked 2 (second best). Institutional controls alone would not reduce the OE hazard level in this area and would not be an effective alternative unless it is implemented in conjunction with a clearance action; therefore, institutional controls is ranked 3 (last) for Area O.

8.3.4.4 Overall Implementability Ranking for Alternatives 1 through 4.

Surface Clearance of OE (Alternative 3) is ranked as the best overall alternative in terms of implementability for Area O (see Table 8-59) due to the high OE hazard level and that the area is easily accessible by the local community. Subsurface Clearance of OE to Depth of Detection (Alternative 4) is ranked 2 (second best), based on implementability issues. Institutional Controls (Alternative 2) is ranked 3 (last) because it would not be considered as an acceptable stand-alone alternative to local agencies and the community, as it does not involve the removal of OE.

8.3.4.5 Cost.

Table 8-60 provides the cost criteria of the four alternatives for Area O. The evaluation of each of these alternatives is presented below.

Table 8-60. Cost Criteria Evaluation for Area O

Alternative	Cost	Investment	Benefit	Score	Rank
2, Institutional Controls	$86,836	1	3	4	2
3, Surface Clearance	$1,244,515	2	1	3	1
4, Subsurface Clearance to Depth	$7,690,298	3	2	5	3

Note: Ranking from best to worst; best = 1.

Investment and Benefit. There are minimal costs associated with institutional controls; therefore, institutional controls is ranked 1 (best) in terms of investment. The alternative that provides the greatest benefit, in terms of dollars spent to effect results, appears to be the surface clearance, followed by the subsurface clearance to depth of detection and institutional controls. The cost of implementing institutional controls is lower than that of any clearance alternative; however, the benefit of implementation in protecting human safety would be much lower than the benefit of either the surface or subsurface clearance actions.

8.3.4.6 Overall Cost Ranking for Alternatives 1 through 4.

The Surface Clearance of OE (Alternative 3) is ranked as the best OE response action alternative in terms of cost for Area O (see Table 8-60), based upon its ability to reduce the OE hazard level and potential for exposure to OE in this area for dollars spent to effect results. Institutional Controls (Alternative 2) is ranked 2 (second best) because it has the ability to reduce the OE hazard level in this area and the benefit of implementation could be similar to that of a surface clearance, depending on local agency and community support and involvement. The Subsurface Clearance of OE to Depth of Detection (Alternative 4) is ranked 3 (last), based on cost.

8.3.4.7 Overall Ranking of Alternatives for Area O.

The overall ranking of the different alternatives in terms of their effectiveness, implementability, and cost is presented in Table 8-61. The alternative with the lowest score is considered best for each criterion (effectiveness, implementability, and cost) evaluated.

Table 8-61. Alternative Evaluation for Area O

Alternative	Effectiveness Rank	Implementability Rank	Cost Rank	Overall Score	Overall Rank
2, Institutional Controls	3	3	2	8	3
3, Surface Clearance	2	1	1	4	1
4, Subsurface Clearance to Depth	1	2	3	6	2

Note: Ranking from best to worst; best = 1.

Surface Clearance of OE (Alternative 3) is ranked as the best overall OE response action alternative for Area O due to the high OE hazard level in this area, the current use of this area by the local community, and the construction for future expansion that is currently underway. Subsurface Clearance of OE to Depth of Detection (Alternative 4) is ranked 2 (second best), based on cost and implementability issues. Institutional Controls (Alternative 2), because it would not be accepted by local agencies or the community as an acceptable or appropriate OE response action alternative in this area, is ranked 3 (last). Specific recommendations for Area O are made in Chapter 9.0, Recommended OE Response Action Alternatives.

8.3.5 Area P

The overall OE hazard level in this area is high (see Figure 8-1), based on the results of the Phase II EE/CA field investigation and evaluation of the three risk factors (OE Type, Site Characteristics, and Site Demographics) defined in the qualitative risk assessment (Chapter 4.0). Using this information, the four OE response action alternatives evaluated in this EE/CA report are comparatively analyzed in the following subsections to determine the most appropriate OE response action alternatives for Area P.

8.3.5.1 Effectiveness.

Table 8-62 provides the effectiveness criteria of the four alternatives for Area P. The evaluation of each of these alternatives is presented below.

Table 8-62. Effectiveness Criteria Evaluation for Area P

	Effectiveness					
Alternative	Protection of Human Safety	Compliance with ARARs	Long Term	Short Term	Score	Rank
1, No Action Indicated (NAI)	NA	NC	NC	NC	NC	NC
2, Institutional Controls	3	1	3	3	10	3
3, Surface Clearance	2	1	2	1	6	2
4, Subsurface Clearance to Depth	1	1	1	2	5	1

Note: Ranking from best to worst; best = 1.
ARAR = applicable or relevant and appropriate requirement
NA = not applicable
NC = not considered

Protection of Human Safety. NAI is considered an unacceptable OE response action alternative for Area P because it does not meet the minimum threshold criterion for the protection of human safety; therefore, NAI is not evaluated further as an acceptable OE response action alternative for Area P. Institutional controls is ranked 3 (third best) for protection of human safety because it does not involve the removal of OE and is therefore less protective of human safety in an area with a high OE hazard level than the surface clearance or the subsurface clearance to depth of detection. Surface clearance is ranked 2 (second best), and subsurface clearance to depth of detection is ranked 1 (best) for protection of human safety, based upon their ability to provide the greatest reduction in risk

associated with the high OE hazard level in this area.

Compliance with ARARs. Compliance with ARARs has been ranked equally among Alternatives 2 through 4, as full compliance with the ARARs is expected with minimal impact to the environment.

Long-term Effectiveness. Institutional controls is ranked 3 (last) because it would not be effective over the long term in reducing the risk associated with the high OE hazard level in Area P. Surface clearance is ranked 2 (second best) as it would be more effective over the long term than institutional controls, but less effective over the long term than a subsurface clearance to depth of detection. Subsurface clearance to depth of detection is ranked 1 (best) because it would provide the maximum protection of human safety and would be the most effective OE response action alternative over the long term.

Short-term Effectiveness. Institutional controls is ranked 3 (last) for short-term effectiveness because of the length of time necessary to implement the alternative to the point that it affords protection. The time involved includes identifying landowners and responsible agencies, meeting with landowners and local agencies to confirm the location of display cases and warning signs, and coordination of the distribution of informational pamphlets and establishment of local community awareness meetings. Surface clearance is ranked 1 (best) for short-term effectiveness, as it would take less time to implement and would be more effective over the short term than institutional controls or a subsurface clearance to depth of detection. Subsurface clearance to depth of detection ranked 2 (second best) for short-term effectiveness, as it would take significantly more time to implement than a surface clearance, but less time to implement than institutional controls.

8.3.5.2 Overall Effectiveness Ranking for Alternatives 1 through 4.

Subsurface Clearance of OE to Depth of Detection (Alternative 4) is ranked as the best overall alternative in terms of effectiveness for Area P (see Table 8-62), based upon its ability to reduce the risk associated with the high OE hazard level in this area and because it provides the most effective protection to the public from OE. Surface Clearance of OE (Alternative 3) is ranked 2 (second best) because it would not offer the most effective protection to the public and would not be the most effective OE response action alternative over the long term. Institutional Controls (Alternative 2) is ranked 3 (last) because it would take too much time to coordinate with landowners and local agencies and would not be effective as a stand-alone alternative in an area with a high OE hazard level.

8.3.5.3 Implementability.

Table 8-63 provides the implementability criteria of the four alternatives for Area P. The evaluation of each of these alternatives is presented below.

Table 8-63. Implementability Criteria Evaluation for Area P

	Implementability						
Alternative	Technical Feasibility	Administrative Feasibility	Services and Materials	Local Agency Acceptance	Community Acceptance	Score	Rank
2, Institutional Controls	3	3	1	3	3	13	3
3, Surface Clearance	1	1	2	2	2	8	1
4, Subsurface Clearance to Depth	2	2	3	1	1	9	2

Note: Ranking from best to worst; best = 1.

Technical and Administrative Feasibility. Implementing the institutional controls alternative would require more logistical and management support than a clearance action because the process must be conducted in close coordination with local agencies and the community. Although the supplies and personnel needed to construct display cases, install warning signs, conduct educational programs, and implement and oversee use restrictions are readily available; the length of time necessary to identify landowners and coordinate the implementation of institutional controls with landowners would be much greater than the relatively short length of time required to implement a clearance action. Therefore, institutional controls is ranked 3 (last) from a technical and administrative feasibility standpoint.

Implementation of a surface clearance would be quite feasible from a technical and administrative perspective. The surface clearance would be relatively easier to implement than institutional controls or the subsurface clearance to depth of detection. Therefore, surface clearance is ranked 1 (best) for technical and administrative feasibility.

From technical and administrative perspectives, implementation of a subsurface clearance to depth of detection is quite feasible. This alternative generally requires less logistical and management support than institutional controls, but requires more logistical and management support than a surface clearance. Unlike a surface clearance, a subsurface clearance to depth of detection requires excavation equipment (in addition to specially trained and qualified personnel and a means of OE disposal, which is required for all clearance actions). Therefore, the subsurface clearance to depth of detection is ranked 2 (second best) in terms of technical and administrative feasibility, as it would take more time and effort to implement than the surface clearance, but less time and effort to implement than institutional controls.

Services and Materials. Institutional controls is ranked 1 (best) because the supplies and personnel needed to construct and install display cases and warning signs, conduct educational programs, and implement and oversee use restrictions are readily available. Surface clearance is ranked 2 (second best) because it would require specially trained and qualified personnel as well as the means of disposing of any encountered OE. Unlike a surface clearance, implementation of a subsurface clearance to depth of detection requires excavation equipment (in addition to specially trained and qualified personnel and a means of OE disposal, which is required for all clearance actions).

Therefore, this alternative is ranked 3 (last) for availability of services and materials.

Local Agency Acceptance. Based on interaction with agency representatives to date, it has been determined that local agencies are likely to consider subsurface clearance to depth of detection as the most appropriate and acceptable alternative for Area P, based on the high OE hazard level and that the area is easily accessible. Surface clearance is ranked 2 (second best), and institutional controls is ranked 3 (last).

Community Acceptance. Based on interaction with the community during the EE/CA investigation and during RAB meetings, the community is likely to consider subsurface clearance to depth of detection as the most appropriate and acceptable alternative for Area P, based on the high OE hazard level and that the area is easily accessible by the local community. Surface clearance, because it would only remove OE (if present) from the surface, is ranked 2 (second best). Institutional controls alone would not reduce the OE hazard level in this area and would not be an effective alternative unless it is implemented in conjunction with a clearance action; therefore, institutional controls is ranked 3 (last) for Area P.

8.3.5.4 Overall Implementability Ranking for Alternatives 1 through 4.

Surface Clearance of OE (Alternative 3) is ranked as the best overall alternative in terms of implementability for Area P (see Table 8-63) due to the high OE hazard level and that the area is easily accessible by the local community. Subsurface Clearance of OE to Depth of Detection (Alternative 4) is ranked 2 (second best), based on implementability issues. Institutional Controls (Alternative 2) is ranked 3 (last) because it would not be considered as an acceptable stand-alone alternative to local agencies and the community, as it does not involve the removal of OE.

8.3.5.5 Cost.

Table 8-64 provides the cost criteria of the four alternatives for Area P. The evaluation of each of these alternatives is presented below.

Table 8-64. Cost Criteria Evaluation for Area P

Alternative	Cost	Investment	Benefit	Score	Rank
2, Institutional Controls	$737,311	1	3	4	2
3, Surface Clearance	$35,591,550	2	1	3	1
4, Subsurface Clearance to Depth	$205,091,466	3	2	5	3

Note: Ranking from best to worst; best = 1.

Investment and Benefit. There are minimal costs associated with institutional controls; therefore, institutional controls is ranked 1 (best) in terms of investment. The alternative that provides the greatest benefit, in terms of dollars spent to effect results, appears to be the surface clearance, followed by the subsurface clearance to depth of detection and institutional controls. The cost of

implementing institutional controls is lower than that of any clearance alternative; however, the benefit of implementation in protecting human safety would be much lower than the benefit of either the surface or subsurface clearance actions.

8.3.5.6 Overall Cost Ranking for Alternatives 1 through 4.

The Surface Clearance of OE (Alternative 3) is ranked as the best OE response action alternative in terms of cost for Area P (see Table 8-64), based upon its ability to reduce the OE hazard level and potential for exposure to OE in this area for dollars spent to effect results. Institutional Controls (Alternative 2) is ranked 2 (second best) because it has the ability to reduce the OE hazard level in this area and the benefit of implementation could be similar to that of a surface clearance, depending on local agency and community support and involvement. The Subsurface Clearance of OE to Depth of Detection (Alternative 4) is ranked 3 (last), based on cost.

8.3.5.7 Overall Ranking of Alternatives for Area P.

The overall ranking of the different alternatives in terms of their effectiveness, implementability, and cost is presented in Table 8-65. The alternative with the lowest score is considered best for each criterion (effectiveness, implementability, and cost) evaluated.

Table 8-65. Alternative Evaluation for Area P

Alternative	Effectiveness Rank	Implementability Rank	Cost Rank	Overall Score	Overall Rank
2, Institutional Controls	3	3	2	8	3
3, Surface Clearance	2	1	1	4	1
4, Subsurface Clearance to Depth	1	2	3	6	2

Note: Ranking from best to worst; best = 1.

Surface Clearance of OE (Alternative 3) is ranked as the best overall OE response action alternative for Area P due to the high OE hazard level in this area, the current use of this area by the local community, and the construction for future expansion that is currently planned. The Subsurface Clearance of OE to Depth of Detection (Alternative 4) is ranked 2 (second best) based on cost and implementability issues. Institutional Controls (Alternative 2), because it would not be accepted by local agencies or the community as an acceptable or appropriate OE response action alternative in this area, is ranked 3 (last). Specific recommendations for Area P are made in Chapter 9.0, Recommended OE Response Action Alternatives.

8.3.6 Area Q

The overall OE hazard level in this area is high (see Figure 8-1), based on the results of the Phase II EE/CA field investigation and evaluation of the three risk factors (OE Type, Site Characteristics, and Site Demographics) defined in the

qualitative risk assessment (Chapter 4.0). Using this information, the four OE response action alternatives evaluated in this EE/CA report are comparatively analyzed in the following subsections to determine the most appropriate OE response action alternatives for Area Q.

8.3.6.1 Effectiveness.

Table 8-66 provides the effectiveness criteria of the four alternatives for Area Q. The evaluation of each of these alternatives is presented below.

Table 8-66. Effectiveness Criteria Evaluation for Area Q

	Effectiveness					
Alternative	Protection of Human Safety	Compliance with ARARs	Long Term	Short Term	Score	Rank
1, No Action Indicated (NAI)	NA	NC	NC	NC	NC	NC
2, Institutional Controls	3	1	3	3	10	3
3, Surface Clearance	2	1	2	1	6	2
4, Subsurface Clearance to Depth	1	1	1	2	5	1

Note: Ranking from best to worst; best = 1.
ARAR = applicable or relevant and appropriate requirement
NA = not applicable
NC = not considered

Protection of Human Safety. NAI is considered an unacceptable OE response action alternative for Area Q because it does not meet the minimum threshold criterion for the protection of human safety; therefore, NAI is not evaluated further as an acceptable OE response action alternative for Area Q. Institutional controls is ranked 3 (third best) for protection of human safety because it does not involve the removal of OE and is therefore less protective of human safety in an area with a high OE hazard level than the surface clearance or the subsurface clearance to depth of detection. Surface clearance is ranked 2 (second best) and subsurface clearance to depth of detection is ranked 1 (best) for protection of human safety based upon their ability to provide the greatest reduction in risk associated with the high OE hazard level in this area.

Compliance with ARARs. Compliance with ARARs has been ranked equally among Alternatives 2 through 4, as full compliance with the ARARs is expected with minimal impact to the environment.

Long-term Effectiveness. Institutional controls is ranked 3 (last) because it would not be effective over the long term in reducing the risk associated with the high OE hazard level in Area Q. Surface clearance is ranked 2 (second best) as it would be more effective over the long term than institutional controls, but less effective over the long term than a subsurface clearance to depth of detection. Subsurface clearance to depth of detection is ranked 1 (best) because it would provide the maximum protection of human safety and would be the most effective OE response action alternative over the long term.

Short-term Effectiveness. Institutional controls is ranked 3 (last) for short-term effectiveness because of the length of time necessary to implement the alternative to the point that it affords protection. The time involved includes identifying landowners and responsible agencies, meeting with landowners and local agencies to confirm the location of display cases and warning signs, and coordination of the distribution of informational pamphlets and establishment of local community awareness meetings. Surface clearance is ranked 1 (best) for short-term effectiveness, as it would take less time to implement and would be more effective over the short term than institutional controls or a subsurface clearance to depth of detection. Subsurface clearance to depth of detection is ranked 2 (second best) for short-term effectiveness, as it would take significantly more time to implement than a surface clearance, but less time to implement than institutional controls.

8.3.6.2 Overall Effectiveness Ranking for Alternatives 1 through 4.

Subsurface Clearance of OE to Depth of Detection (Alternative 4) is ranked as the best overall alternative in terms of effectiveness for Area Q (see Table 8-66), based upon its ability to reduce the risk associated with the high OE hazard level in this area and because it provides the most effective protection to the public from OE. Surface Clearance of OE (Alternative 3) is ranked 2 (second best) because it would not offer the most effective protection to the public and would not be the most effective OE response action alternative over the long term. Institutional Controls (Alternative 2) is ranked 3 (last) because it would take too much time to coordinate with landowners and local agencies and would not be effective as a stand alone alternative in an area with a high OE hazard level.

8.3.6.3 Implementability.

Table 8-67 provides the implementability criteria of the four alternatives for Area Q. The evaluation of each of these alternatives is presented below.

Table 8-67. Implementability Criteria Evaluation for Area Q

	Implementability						
Alternative	Technical Feasibility	Administrative Feasibility	Services and Materials	Local Agency Acceptance	Community Acceptance	Score	Rank
2, Institutional Controls	3	3	1	3	3	13	3
3, Surface Clearance	1	1	2	2	2	8	1
4, Subsurface Clearance to Depth	2	2	3	1	1	9	2

Note: Ranking from best to worst; best = 1.

Technical and Administrative Feasibility. Implementing the institutional controls alternative would require more logistical and management support than a clearance action because the process must be conducted in close coordination with local agencies and the community. Although the supplies and personnel needed to construct display cases, install warning signs, conduct educational programs, and implement and oversee use restrictions are readily available; the

length of time necessary to identify landowners and coordinate the implementation of institutional controls with landowners would be much greater than the relatively short length of time required to implement a clearance action. Therefore, institutional controls is ranked 3 (last) from a technical and administrative feasibility standpoint.

Implementation of a surface clearance would be quite feasible from a technical and administrative perspective. Surface clearance would be relatively easier to implement than institutional controls or subsurface clearance to depth of detection. Therefore, surface clearance is ranked 1 (best) for technical and administrative feasibility.

From technical and administrative perspectives, implementation of a subsurface clearance to depth of detection is quite feasible. This alternative generally requires less logistical and management support than institutional controls, but requires more logistical and management support than a surface clearance. Unlike a surface clearance, a subsurface clearance to depth of detection requires excavation equipment (in addition to specially trained and qualified personnel and a means of OE disposal, which is required for all clearance actions). Therefore, subsurface clearance to depth of detection is ranked 2 (second best) in terms of technical and administrative feasibility, as it would take more time and effort to implement than the surface clearance, but less time and effort to implement than institutional controls.

Services and Materials. Institutional controls is ranked 1 (best) because the supplies and personnel needed to construct and install display cases and warning signs, conduct educational programs, and implement and oversee use restrictions are readily available. Surface clearance is ranked 2 (second best) because it would require specially trained and qualified personnel as well as the means of disposing of any encountered OE. Unlike a surface clearance, implementation of a subsurface clearance to depth of detection requires excavation equipment (in addition to specially trained and qualified personnel and a means of OE disposal, which is required for all clearance actions). Therefore, this alternative is ranked 3 (last) for availability of services and materials.

Local Agency Acceptance. Based on interaction with agency representatives to date, it has been determined that local agencies are likely to consider subsurface clearance to depth of detection as the most appropriate and acceptable alternative for Area Q, based on the high OE hazard level and that the area is easily accessible. Surface clearance is ranked 2 (second best) and institutional controls is ranked 3 (last).

Community Acceptance. Based on interaction with the community during the EE/CA investigation and during RAB meetings, the community is likely to consider subsurface clearance to depth of detection as the most appropriate and acceptable alternative for Area Q, based on the high OE hazard level and that the area is easily accessible by the local community. Surface clearance, because it would only remove OE (if present) from the surface, is ranked 2 (second best). Institutional controls alone would not reduce the OE hazard level

in this area and would not be an effective alternative unless it is implemented in conjunction with a clearance action; therefore, institutional controls is ranked 3 (last) for Area Q.

8.3.6.4 Overall Implementability Ranking for Alternatives 1 through 4.

Surface Clearance of OE (Alternative 3) is ranked as the best overall alternative in terms of implementability for Area Q (see Table 8-67) due to the high OE hazard level and that the area is easily accessible by the local community. Subsurface Clearance of OE to Depth of Detection (Alternative 4) is ranked 2 (second best), based on implementability issues. Institutional Controls (Alternative 2) is ranked 3 (last) because it would not be considered as an acceptable stand-alone alternative to local agencies and the community, as it does not involve the removal of OE.

8.3.6.5 Cost.

Table 8-68 provides the cost criteria of the four alternatives for Area Q. The evaluation of each of these alternatives is presented below.

Table 8-68. Cost Criteria Evaluation for Area Q

Alternative	Cost	Investment	Benefit	Score	Rank
2, Institutional Controls	$196,217	1	3	4	2
3, Surface Clearance	$2,901,670	2	1	3	1
4, Subsurface Clearance to Depth	$28,144,344	3	2	5	3

Note: Ranking from best to worst; best = 1.

Investment and Benefit. There are minimal costs associated with institutional controls; therefore, institutional controls is ranked 1 (best) in terms of investment. The alternative that provides the greatest benefit, in terms of dollars spent to effect results, appears to be the surface clearance, followed by the subsurface clearance to depth of detection and institutional controls. The cost of implementing institutional controls is lower than that of any clearance alternative; however, the benefit of implementation in protecting human safety would be much lower than the benefit of either the surface or subsurface clearance actions.

8.3.6.6 Overall Cost Ranking for Alternatives 1 through 4.

Surface Clearance of OE (Alternative 3) is ranked as the best OE response action alternative in terms of cost for Area Q (see Table 8-68), based upon its ability to reduce the OE hazard level and potential for exposure to OE in this area for dollars spent to effect results. Institutional Controls (Alternative 2) is ranked 2 (second best) because it has the ability to reduce the OE hazard level in this area and the benefit of implementation could be similar to that of a surface clearance, depending on local agency and community support and involvement. The Subsurface Clearance of OE to Depth of Detection (Alternative 4) is ranked 3 (last) based on cost.

8.3.6.7 Overall Ranking of Alternatives for Area Q.

The overall ranking of the different alternatives in terms of their effectiveness, implementability, and cost is presented in Table 8-69. The alternative with the lowest score is considered best for each criterion (effectiveness, implementability, and cost) evaluated.

Table 8-69. Alternative Evaluation for Area Q

Alternative	Effectiveness Rank	Implementability Rank	Cost Rank	Overall Score	Overall Rank
2, Institutional Controls	3	3	2	8	3
3, Surface Clearance	2	1	1	4	1
4, Subsurface Clearance to Depth	1	2	3	6	2

Note: Ranking from best to worst; best = 1.

Surface Clearance of OE (Alternative 3) is ranked as the best overall OE response action alternative for Area Q due to the high OE hazard level in this area and the current and future use of this area by the local community. The Subsurface Clearance of OE to Depth of Detection (Alternative 4) is ranked 2 (second best), based on cost and implementability issues. Institutional Controls (Alternative 2), because it would not be accepted by local agencies or the community as an acceptable or appropriate OE response action alternative in this area, is ranked 3 (last). Specific recommendations for Area Q are made in Chapter 9.0, Recommended OE Response Action Alternatives.

8.3.7 Area R

The overall OE hazard level in this area is low (see Figure 8-1), based on the results of the Phase II EE/CA field investigation and evaluation of the three risk factors (OE Type, Site Characteristics, and Site Demographics) defined in the qualitative risk assessment (Chapter 4.0). Using this information, the four OE response action alternatives evaluated in this EE/CA report are comparatively analyzed in the following subsections to determine the most appropriate OE response action alternatives for Area R.

8.3.7.1 Effectiveness.

Table 8-70 provides the effectiveness criteria of the four alternatives for Area R. The evaluation of each of these alternatives is presented below.

Protection of Human Safety. Although the OE hazard level in this area is low, there will always be a residual risk associated with OE at the former maneuver area, based on past military use of the site; therefore, institutional controls, because of its ability to educate the public concerning the risk associated with OE, is ranked 1 (best) for protection of human safety. Because the OE hazard

Table 8-70. Effectiveness Criteria Evaluation for Area R

Alternative	Effectiveness: Protection of Human Safety	Effectiveness: Compliance with ARARs	Effectiveness: Long Term	Effectiveness: Short Term	Score	Rank
1, No Action Indicated (NAI)	4	1	4	1	10	3
2, Institutional Controls	1	1	1	2	5	1
3, Surface Clearance	2	1	2	3	8	2
4, Subsurface Clearance to Depth	3	1	3	4	11	4

Note: Ranking from best to worst; best = 1.
ARAR = applicable or relevant and appropriate requirement

level in this area is low, there is essentially little to be gained with regard to protection of human safety by performing a surface clearance or subsurface clearance to depth of detection in this area; therefore, the surface clearance is ranked 2 (second best) and the subsurface clearance to depth of detection is ranked 3 (third best). NAI is ranked 4 (last) because it would do nothing to protect human safety, even in an area with only a residual risk.

Compliance with ARARs. Compliance with ARARs has been ranked equally among Alternatives 1 through 4, as full compliance with the ARARs is expected with minimal impact to the environment.

Long-term Effectiveness. Institutional controls, in an area with a low OE hazard level, would be the most effective alternative over the long term because it would educate and inform the public concerning the residual risk associated with OE in this area. Because the OE hazard level in this area is low, there is essentially little to be gained in terms of effectiveness over the long term by performing a surface clearance or subsurface clearance to depth of detection; therefore, the surface clearance is ranked 2 (second best), and the subsurface clearance to depth of detection is ranked 3 (third best). NAI is ranked 4 (last) because it would not be an effective risk reduction measure over the long-term.

Short-term Effectiveness. Since the OE hazard level in this area is low, NAI would be the most effective alternative over the short term. Institutional controls is ranked 2 (second best) for short-term effectiveness because it would require an extended effort and additional time to coordinate with landowners and local agencies for implementation. The level of short-term effectiveness gained from a surface clearance or subsurface clearance to depth of detection is relatively lower than the effectiveness of NAI or institutional controls because the OE hazard level is already low; therefore, surface clearance is ranked 3 (third best) and subsurface clearance to depth of detection is ranked 4 (last).

8.3.7.2 Overall Effectiveness Ranking for Alternatives 1 through 4.

Institutional Controls (Alternative 2) is ranked as the most effective OE response action alternative because the OE hazard level is this area is already low. Surface Clearance of OE (Alternative 3) is ranked 2 (second best) and NAI (Alternative 1) is ranked 3 (third best). Because the OE hazard level in this area is already low, there would be minimal effectiveness in performing a subsurface

clearance; therefore, Subsurface Clearance of OE to Depth of Detection (Alternative 4) is ranked 4 (last) in terms of effectiveness.

8.3.7.3 Implementability.

Table 8-71 provides the implementability criteria of the four alternatives for Area R. The evaluation of each of these alternatives is presented below.

Table 8-71. Implementability Criteria Evaluation for Area R

	Implementability						
Alternative	Technical Feasibility	Administrative Feasibility	Services and Materials	Local Agency Acceptance	Community Acceptance	Score	Rank
1, No Action Indicated (NAI)	1	1	1	4	4	11	2
2, Institutional Controls	4	4	2	3	3	16	4
3, Surface Clearance	2	2	3	2	1	10	1
4, Subsurface Clearance to Depth	3	3	4	1	2	13	3

Note: Ranking from best to worst; best = 1.

Technical and Administrative Feasibility. Implementing the NAI alternative would be easier than implementing any of the other alternatives, from both an administrative and a technical feasibility perspective, as no effort, materials, or services would be required. Therefore, NAI is ranked 1 (best) for technical and administrative feasibility.

Implementing institutional controls would require more logistical and management support than a clearance action because the process must be conducted in close coordination with local agencies, landowners, and the community. Although the supplies and personnel needed to construct display cases, install warning signs, conduct educational programs, and implement and oversee use restrictions are readily available, the length of time necessary to identify landowners and coordinate the implementation of institutional controls with landowners would be much greater than the relatively short length of time required to implement a clearance action. Therefore, institutional controls is ranked 4 (last) from a technical and administrative feasibility standpoint.

Implementation of a surface clearance would be quite feasible from a technical and administrative perspective. While relatively easier to implement than institutional controls or the subsurface clearance to depth of detection, the surface clearance would require more effort to implement than NAI (which requires no effort). Therefore, surface clearance is ranked 2 (second best) for technical and administrative feasibility.

From technical and administrative perspectives, implementation of a subsurface clearance to depth of detection is quite feasible. This alternative generally requires less logistical and management support than institutional controls, but requires more logistical and management support than a surface clearance or NAI. Unlike a surface clearance, a subsurface clearance to depth of detection

requires excavation equipment (in addition to specially trained and qualified personnel and a means of OE disposal, which is required for all clearance actions). Therefore, subsurface clearance to depth of detection is ranked 3 (third best) in terms of technical and administrative feasibility, as it would take more time and effort to implement than a surface clearance or NAI, but less time and effort to implement than institutional controls.

Services and Materials. NAI is ranked 1 (best) for services and materials, as no effort, materials, or services would be required. Institutional controls is ranked 2 (second best) because the supplies and personnel needed to construct display cases, install warning signs, conduct educational programs, and implement and oversee use restrictions are readily available. Surface clearance is ranked 3 (third best) because it would require specially trained and qualified personnel as well as the means of disposing of any encountered OE. Unlike a surface clearance, implementation of a subsurface clearance to depth of detection requires excavation equipment (in addition to specially trained and qualified personnel and a means of OE disposal, which is required for all clearance actions). Therefore, subsurface clearance to depth of detection is ranked 4 (last) for availability of services and materials.

Local Agency Acceptance. Based on interaction with agency representatives to date, it has been determined that local agencies are likely to consider a subsurface clearance to depth of detection as the most acceptable alternative based on the land use in Area R; therefore, subsurface clearance to depth of detection is ranked 1 (best) in terms of local agency acceptance. Local agencies would be more likely to consider a surface clearance over institutional controls or NAI because of land use in this area; therefore, surface clearance is ranked 2 (second best), institutional controls is ranked 3 (third best), and NAI is ranked 4 (last).

Community Acceptance. Based on interaction with the community during the EE/CA investigation and during RAB meetings, the community is likely to consider a surface clearance as the most acceptable alternative, based on the projected future land use for this area; therefore, surface clearance is ranked 1 (best) in terms of community acceptance. The community is more likely to consider a subsurface clearance to depth of detection or institutional controls over NAI due to the land use intended for this area. Therefore, the subsurface clearance to depth of detection is ranked 2 (second best) and institutional controls is ranked 3 (third best). NAI is ranked 4 (last) in terms of community acceptance.

8.3.7.4 Overall Implementability Ranking for Alternatives 1 through 4.

Surface Clearance of OE (Alternative 3) is ranked as the best overall OE response action alternative in terms of implementability for Area R (see Table 8-71), based upon the planned future land use for this area and its acceptance by the community. NAI (Alternative 1) is ranked 2 (second best), based on technical and administrative feasibility issues. Subsurface Clearance of OE to Depth of Detection (Alternative 4) is ranked 3 (third best), based on technical and administrative feasibility issues and the lack of immediate availability of services

and materials. Institutional Controls (Alternative 2) ranked 4 (last), based on technical and administrative feasibility issues and the lack of acceptance of this alternative by local agencies and the community.

8.3.7.5 Cost.

Table 8-72 provides the cost criteria of the four alternatives for Area R. The evaluation of each of these alternatives is presented below.

Table 8-72. Cost Criteria Evaluation for Area R

Alternative	Cost	Investment	Benefit	Score	Rank
1, No Action Indicated (NAI)	$0	1	2	3	1
2, Institutional Controls	$63,409	2	1	3	1
3, Surface Clearance	$818,620	3	3	6	3
4, Subsurface Clearance to Depth	$33,256,070	4	4	8	4

Note: Ranking from best to worst; best = 1.

Investment and Benefit. There is no cost associated with NAI; therefore, NAI is ranked 1 (best) in terms of investment. The alternative that provides the greatest benefit, in terms of dollars spent to effect results, appears to be institutional controls. Although the OE hazard level in this area is low, it would be beneficial to inform and educate the public concerning the dangers associated with ordnance. Because the OE hazard level is already low, there would be minimal (if any) risk reduction benefits that could be gained by performing a surface clearance or a subsurface clearance to depth of detection.

8.3.7.6 Overall Cost Ranking for Alternatives 1 through 4.

NAI (Alternative 1) and Institutional Controls (Alternative 2) are both ranked as the best overall alternative in terms of cost for Area R. The OE hazard level in this area is already low; therefore, NAI and institutional controls are tied as the most cost effective alternatives. Because the OE hazard level in this area is already low, very little benefit would be gained by implementing Surface Clearance of OE (Alternative 3) or Subsurface Clearance of OE to Depth of Detection (Alternative 4).

8.3.7.7 Overall Ranking of Alternatives for Area R.

The overall ranking of the different alternatives in terms of their effectiveness, implementability, and cost is presented in Table 8-73. The alternative with the lowest score is considered best for each criterion (effectiveness, implementability, and cost) evaluated.

Because the OE hazard level in Area R is low, NAI (Alternative 1), Institutional Controls (Alternative 2), and Surface Clearance of OE (Alternative 3) are all equally ranked as the best overall OE response action alternatives. Very little benefit would be gained by conducting extensive risk reduction efforts in an area

Table 8-73. Alternative Evaluation for Area R

Alternative	Effectiveness Rank	Implementability Rank	Cost Rank	Overall Score	Overall Rank
1, No Action Indicated (NAI)	3	2	1	6	1
2, Institutional Controls	1	4	1	6	1
3, Surface Clearance	2	1	3	6	1
4, Subsurface Clearance to Depth	4	3	4	11	4

Note: Ranking from best to worst; best = 1.

where the OE hazard level is already low; therefore, Subsurface Clearance of OE to Depth of Detection (Alternative 4) is ranked 4 (last). Specific recommendations for Area R are made in Chapter 9.0, Recommended OE Response Action Alternatives.

8.3.8 Area S

The overall OE hazard level in this area is moderate (see Figure 8-1), based on the results of the Phase II EE/CA field investigation and evaluation of the three risk factors (OE Type, Site Characteristics, and Site Demographics) defined in the qualitative risk assessment (Chapter 4.0). Using this information, the four OE response action alternatives evaluated in this EE/CA report are comparatively analyzed in the following subsections to determine the most appropriate OE response action alternatives for Area S.

8.3.8.1 Effectiveness.

Table 8-74 provides the effectiveness criteria of the four alternatives for Area S. The evaluation of each of these alternatives is presented below.

Table 8-74. Effectiveness Criteria Evaluation for Area S

	Effectiveness					
Alternative	Protection of Human Safety	Compliance with ARARs	Long Term	Short Term	Score	Rank
1, No Action Indicated (NAI)	4	1	4	4	13	4
2, Institutional Controls	3	1	3	3	10	3
3, Surface Clearance	2	1	2	1	6	2
4, Subsurface Clearance to Depth	1	1	1	2	5	1

Note: Ranking from best to worst; best = 1.
ARAR = applicable or relevant and appropriate requirement

Protection of Human Safety. If the NAI alternative were implemented, the potential for exposure to OE would remain unchanged; therefore, NAI is ranked 4 (last) for protection of human safety. Institutional controls is ranked 3 (third best) for protection of human safety because it would not involve the removal of ordnance in an area with a moderate OE hazard level and would therefore not be the most effective in protecting human safety. Surface clearance would reduce the potential for exposure to OE in this area; therefore, surface clearance is

ranked 2 (second best) in terms of protection of human safety. Subsurface clearance to depth of detection is ranked 1 (best) because it would offer the greatest reduction in exposure to OE and provide the maximum protection of human safety in an area with a moderate OE hazard level.

Compliance with ARARs. Compliance with ARARs has been ranked equally among Alternatives 1 through 4, as full compliance with the ARARs is expected with minimal impact to the environment.

Long-term Effectiveness. NAI is ranked 4 (last) in terms of long-term effectiveness because it would offer no reduction in risk over the long term. Institutional controls is ranked 3 (third best) because it would not be effective over the long term in reducing the risk associated with the moderate OE hazard level in Area S. Surface clearance is ranked 2 (second best), as it would be more effective over the long term than institutional controls, but less effective over the long term than a subsurface clearance to depth of detection. Subsurface clearance to depth of detection is ranked 1 (best) because it would provide the maximum protection of human safety and would be the most effective OE response action alternative over the long term.

Short-term Effectiveness. NAI is ranked 4 (last) in terms of short-term effectiveness because it would offer no reduction in risk over the short term. Institutional controls is ranked 3 (third best) for short-term effectiveness because of the length of time necessary to implement the alternative to the point that it affords protection. The time involved with implementation of institutional controls includes identifying landowners and responsible agencies, meeting with landowners and local agencies to confirm the location of display cases and warning signs, and coordination of the distribution of informational pamphlets and establishment of local community awareness meetings. Surface clearance is ranked 1 (best) for short-term effectiveness, as it would take less time to implement and would be more effective over the short term than institutional controls or a subsurface clearance to depth of detection. Subsurface clearance to depth of detection is ranked 2 (second best) for short-term effectiveness, as it would take significantly more time to implement than a surface clearance, but less time to implement than institutional controls.

8.3.8.2 Overall Effectiveness Ranking for Alternatives 1 through 4.

Subsurface Clearance of OE to Depth of Detection (Alternative 4) is ranked as the best OE response action alternative in terms of effectiveness for Area S (see Table 8-74), based upon its ability to reduce the potential risk of OE exposure and provide the most effective protection to the public from OE. Surface Clearance of OE (Alternative 3) is ranked 2 (second best), and Institutional Controls (Alternative 2) is ranked 3 (third best) because both would offer less protection to the public in an area with a moderate OE hazard level than the subsurface clearance to depth of detection. NAI (Alternative 1) is ranked 4 (last) because it would do nothing to protect human safety.

8.3.8.3 Implementability.

Table 8-75 provides the implementability criteria of the four alternatives for Area S. The evaluation of each of these alternatives is presented below.

Table 8-75. Implementability Criteria Evaluation for Area S

	Implementability						
Alternative	Technical Feasibility	Administrative Feasibility	Services and Materials	Local Agency Acceptance	Community Acceptance	Score	Rank
1, No Action Indicated (NAI)	1	1	1	4	4	11	2
2, Institutional Controls	4	4	2	3	3	16	4
3, Surface Clearance	2	2	3	1	1	9	1
4, Subsurface Clearance to Depth	3	3	4	2	2	14	3

Note: Ranking from best to worst; best = 1.

Technical and Administrative Feasibility. Implementing the NAI alternative would be easier than implementing any of the other alternatives, from both an administrative and a technical feasibility perspective, as no effort, materials, or services would be required. Therefore, NAI is ranked 1 (best) for technical and administrative feasibility.

Implementing institutional controls would require more logistical and management support than a clearance action because the process must be conducted in close coordination with local agencies, landowners, and the community. Although the supplies and personnel needed to construct display cases, install warning signs, conduct educational programs, and implement and oversee use restrictions are readily available, the length of time necessary to identify landowners and coordinate the implementation of institutional controls with landowners would be much greater than the relatively short length of time required to implement a clearance action. Therefore, institutional controls is ranked 4 (last) from a technical and administrative feasibility standpoint.

Implementation of a surface clearance would be quite feasible from a technical and administrative perspective. While relatively easier to implement than institutional controls or the subsurface clearance to depth of detection, the surface clearance would require more effort to implement than NAI (which requires no effort). Therefore, surface clearance is ranked 2 (second best) for technical and administrative feasibility.

From technical and administrative perspectives, implementation of a subsurface clearance to depth of detection is quite feasible. This alternative generally requires less logistical and management support than institutional controls, but requires more logistical and management support than a surface clearance or NAI. Unlike a surface clearance, a subsurface clearance to depth of detection requires excavation equipment (in addition to specially trained and qualified personnel and a means of OE disposal, which is required for all clearance actions). Therefore, subsurface clearance to depth of detection is ranked 3 (third

best) in terms of technical and administrative feasibility, as it would take more time and effort to implement than a surface clearance or NAI, but less time and effort to implement than institutional controls.

Services and Materials. NAI is ranked 1 (best) for services and materials, as no effort, materials, or services would be required. Institutional controls is ranked 2 (second best) because the supplies and personnel needed to construct display cases, install warning signs, conduct educational programs, and implement and oversee use restrictions are readily available. Surface clearance is ranked 3 (third best) because it would require specially trained and qualified personnel as well as the means of disposing of any encountered OE. Unlike a surface clearance, implementation of a subsurface clearance to depth of detection requires excavation equipment (in addition to specially trained and qualified personnel and a means of OE disposal, which is required for all clearance actions). Therefore, subsurface clearance to depth of detection is ranked 4 (last) for availability of services and materials.

Local Agency Acceptance. Based on interaction with agency representatives to date, it has been determined that local agencies are likely to consider a surface clearance as the most acceptable alternative, based on the moderate OE hazard level in Area S and that OE scrap recovered in this area was only found on the surface; therefore, surface clearance is ranked 1 (best) in terms of local agency acceptance. Local agencies would be more likely to consider a subsurface clearance to depth of detection over institutional controls or NAI, due to the OE scrap recovered in this area; therefore, subsurface clearance to depth of detection is ranked 2 (second best), institutional controls is ranked 3 (third best), and NAI is ranked 4 (last).

Community Acceptance. Based on interaction with the community during the Phase II EE/CA investigation and during RAB meetings, the community is likely to consider a surface clearance as the most acceptable alternative based on the moderate OE hazard level in Area S and that OE scrap recovered in this area was only found on the surface; therefore, surface clearance is ranked 1 (best) in terms of community acceptance. The community would be more likely to consider a subsurface clearance to depth of detection over institutional controls or NAI, due to the OE scrap recovered in this area; therefore, subsurface clearance to depth of detection is ranked 2 (second best), institutional controls is ranked 3 (third best), and NAI is ranked 4 (last).

8.3.8.4 Overall Implementability Ranking for Alternatives 1 through 4.

Surface Clearance of OE (Alternative 3) is ranked as the best overall OE response action alternative in terms of implementability for Area S (see Table 8-75). Although NAI is ranked as the second best alternative in terms of implementability, it is not considered by local agencies or the community as an acceptable or appropriate OE response action alternative for Area S, due to the moderate OE hazard level in this area. Subsurface Clearance of OE to Depth of Detection (Alternative 4) is ranked 3 (third best), based on technical and administrative feasibility issues and the lack of immediate availability of services and materials. Institutional Controls (Alternative 2) is ranked 4 (last), based on

technical and administrative feasibility issues and its lack of acceptance by local agencies and the community as an effective stand-alone alternative.

8.3.8.5 Cost.

Table 8-76 provides the cost criteria of the four alternatives for Area S. The evaluation of each of these alternatives is presented below.

Table 8-76. Cost Criteria Evaluation for Area S

Alternative	Cost	Investment	Benefit	Score	Rank
1, No Action Indicated (NAI)	$0	1	4	5	3
2, Institutional Controls	$15,148	2	2	4	1
3, Surface Clearance	$526,670	3	1	4	1
4, Subsurface Clearance to Depth	$1,495,976	4	3	7	4

Note: Ranking from best to worst; best = 1.

Investment and Benefit. There is no cost associated with NAI; therefore, NAI is ranked 1 (best) in terms of investment. The alternative that provides the greatest benefit, in terms of dollars spent to effect results, appears to be the surface clearance. Institutional controls is ranked 2 (second best) because it offers the opportunity to educate the community concerning the danger associated with OE in this area and has the potential to offer a reduction in the potential for OE exposure similar to that of a surface clearance. Subsurface clearance to depth of detection is ranked 3 (third best) due to the cost. NAI is ranked 4 (last) because it would offer no benefit in terms of reduction of exposure to OE.

8.3.8.6 Overall Cost Ranking for Alternatives 1 through 4.

Institutional Controls (Alternative 2) and Surface Clearance of OE (Alternative 3) are both ranked as the most acceptable alternatives in terms of cost for Area S. Both of these alternatives offer the ability to reduce the potential for exposure to OE in terms of cost benefit and investment. NAI (Alternative 1) is ranked 3 (third best) because it would offer no reduction in the potential for exposure to OE. Subsurface Clearance of OE to Depth of Detection (Alternative 4) is ranked 4 (last) because the high cost of this alternative far outweighs the benefit in reduction to be gained as a result of implementation.

8.3.8.7 Overall Ranking of Alternatives for Area S.

The overall ranking of the different alternatives in terms of their effectiveness, implementability, and cost is presented in Table 8-77. The alternative with the lowest score is considered best for each criterion (effectiveness, implementability, and cost) evaluated.

Surface Clearance of OE (Alternative 3) is ranked as the best overall OE response action alternative for Area S due to the moderate OE hazard level and that the area is frequented daily by tourists and local motorists. Institutional

Table 8-77. Alternative Evaluation for Area S

Alternative	Effectiveness Rank	Implementability Rank	Cost Rank	Overall Score	Overall Rank
1, No Action Indicated (NAI)	4	2	3	9	4
2, Institutional Controls	3	4	1	8	2
3, Surface Clearance	2	1	1	4	1
4, Subsurface Clearance to Depth	1	3	4	8	2

Note: Ranking from best to worst; best = 1.

Controls (Alternative 2) and Subsurface Clearance of OE to Depth of Detection (Alternative 4) are both ranked as the second best alternative for Area S. NAI (Alternative 1) is ranked 4 (last) because Saddle Road is used daily by residents and tourists. Specific recommendations for Area S are made in Chapter 9.0, Recommended OE Response Action Alternatives.

8.3.9 Area T

The overall OE hazard level in this area is moderate (see Figure 8-1), based on the results of the Phase II EE/CA field investigation and evaluation of the three risk factors (OE Type, Site Characteristics, and Site Demographics) defined in the qualitative risk assessment (Chapter 4.0). Using this information, the four OE response action alternatives evaluated in this EE/CA report are comparatively analyzed in the following subsections to determine the most appropriate OE response action alternatives for Area T.

8.3.9.1 Effectiveness.

Table 8-78 provides the effectiveness criteria of the four alternatives for Area T. The evaluation of each of these alternatives is presented below.

Table 8-78. Effectiveness Criteria Evaluation for Area T

	Effectiveness					
Alternative	Protection of Human Safety	Compliance with ARARs	Long Term	Short Term	Score	Rank
1, No Action Indicated (NAI)	4	1	4	4	13	4
2, Institutional Controls	3	1	3	3	10	3
3, Surface Clearance	2	1	2	1	6	2
4, Subsurface Clearance to Depth	1	1	1	2	5	1

Note: Ranking from best to worst; best = 1.
ARAR = applicable or relevant and appropriate requirement

Protection of Human Safety. If the NAI alternative were implemented, the potential for exposure to OE would remain unchanged; therefore, NAI is ranked 4 (last) for protection of human safety. Institutional controls is ranked 3 (third best) for protection of human safety because it would not involve the removal of ordnance in an area with a moderate OE hazard level and would therefore not be the most effective in protecting human safety. Surface clearance would reduce

the potential for exposure to OE in this area; therefore, surface clearance is ranked 2 (second best) in terms of protection of human safety. Subsurface clearance to depth of detection is ranked 1 (best) because it would offer the greatest reduction in exposure to OE and provide the maximum protection of human safety in an area with a moderate OE hazard level.

Compliance with ARARs. Compliance with ARARs has been ranked equally among Alternatives 1 through 4, as full compliance with the ARARs is expected with minimal impact to the environment.

Long-term Effectiveness. NAI is ranked 4 (last) in terms of long-term effectiveness because it would offer no reduction in risk over the long term. Institutional controls is ranked 3 (third best) because it would not be effective over the long term in reducing the risk associated with the moderate OE hazard level in Area T. Surface clearance is ranked 2 (second best), as it would be more effective over the long term than institutional controls, but less effective over the long term than a subsurface clearance to depth of detection. Subsurface clearance to depth of detection is ranked 1 (best) because it would provide the maximum protection of human safety and would be the most effective OE response action alternative over the long term.

Short-term Effectiveness. NAI is ranked 4 (last) in terms of short-term effectiveness because it would offer no reduction in risk over the short term. Institutional controls is ranked 3 (third best) for short-term effectiveness because of the length of time necessary to implement the alternative to the point that it affords protection. The time involved with implementation of institutional controls includes identifying landowners and responsible agencies, meeting with landowners and local agencies to confirm the location of display cases and warning signs, and coordination of the distribution of informational pamphlets and establishment of local community awareness meetings. Surface clearance is ranked 1 (best) for short-term effectiveness, as it would take less time to implement and would be more effective over the short term than institutional controls or a subsurface clearance to depth of detection. Subsurface clearance to depth of detection is ranked 2 (second best) for short-term effectiveness, as it would take significantly more time to implement than a surface clearance, but less time to implement than institutional controls.

8.3.9.2 Overall Effectiveness Ranking for Alternatives 1 through 4.

Subsurface Clearance of OE to Depth of Detection (Alternative 4) is ranked as the best OE response action alternative in terms of effectiveness for Area T (see Table 8-78), based upon its ability to reduce the potential risk of OE exposure and provide the most effective protection to the public from OE. Surface Clearance of OE (Alternative 3) is ranked 2 (second best), and Institutional Controls (Alternative 2) is ranked 3 (third best) because both would offer less protection to the public in an area with a moderate OE hazard level than the subsurface clearance to depth of detection. NAI (Alternative 1) is ranked 4 (last) because it would do nothing to protect human safety.

8.3.9.3 Implementability.

Table 8-79 provides the implementability criteria of the four alternatives for Area T. The evaluation of each of these alternatives is presented below.

Table 8-79. Implementability Criteria Evaluation for Area T

	Implementability						
Alternative	Technical Feasibility	Administrative Feasibility	Services and Materials	Local Agency Acceptance	Community Acceptance	Score	Rank
1, No Action Indicated (NAI)	1	1	1	4	4	11	1
2, Institutional Controls	4	4	2	3	3	16	4
3, Surface Clearance	2	2	3	2	2	11	1
4, Subsurface Clearance to Depth	3	3	4	1	1	12	3

Note: Ranking from best to worst; best = 1.

Technical and Administrative Feasibility. Implementing the NAI alternative would be easier than implementing any of the other alternatives, from both an administrative and a technical feasibility perspective, as no effort, materials, or services would be required. Therefore, NAI is ranked 1 (best) for technical and administrative feasibility.

Implementing institutional controls would require more logistical and management support than a clearance action because the process must be conducted in close coordination with local agencies, landowners, and the community. Although the supplies and personnel needed to construct display cases, install warning signs, conduct educational programs, and implement and oversee use restrictions are readily available, the length of time necessary to identify landowners and coordinate the implementation of institutional controls with landowners would be much greater than the relatively short length of time required to implement a clearance action. Therefore, institutional controls is ranked 4 (last) from a technical and administrative feasibility standpoint.

Implementation of a surface clearance would be quite feasible from a technical and administrative perspective. While relatively easier to implement than institutional controls or the subsurface clearance to depth of detection, the surface clearance would require more effort to implement than NAI (which requires no effort). Therefore, surface clearance is ranked 2 (second best) for technical and administrative feasibility.

From technical and administrative perspectives, implementation of a subsurface clearance to depth of detection is quite feasible. This alternative generally requires less logistical and management support than institutional controls, but requires more logistical and management support than a surface clearance or NAI. Unlike a surface clearance, a subsurface clearance to depth of detection requires excavation equipment (in addition to specially trained and qualified personnel and a means of OE disposal, which is required for all clearance actions). Therefore, subsurface clearance to depth of detection is ranked 3 (third

best) in terms of technical and administrative feasibility, as it would take more time and effort to implement than a surface clearance or NAI, but less time and effort to implement than institutional controls.

Services and Materials. NAI is ranked 1 (best) for services and materials, as no effort, materials, or services would be required. Institutional controls is ranked 2 (second best) because the supplies and personnel needed to construct and install warning signs, conduct educational programs, and implement and oversee use restrictions are readily available. Surface clearance is ranked 3 (third best) because it would require specially trained and qualified personnel as well as the means of disposing of any encountered OE. Unlike a surface clearance, implementation of a subsurface clearance to depth of detection requires excavation equipment (in addition to specially trained and qualified personnel and a means of OE disposal, which is required for all clearance actions). Therefore, subsurface clearance to depth of detection is ranked 4 (last) for availability of services and materials.

Local Agency Acceptance. Based on interaction with agency representatives to date, it has been determined that local agencies are likely to consider a subsurface clearance to depth of detection as the most acceptable alternative based on the moderate OE hazard level in Area T and the planned future development of this area; therefore, subsurface clearance to depth of detection is ranked 1 (best) in terms of local agency acceptance. Local agencies would be more likely to consider a surface clearance over institutional controls or NAI, due to the moderate OE hazard level in this area and the future development planned for this area; therefore, surface clearance is ranked 2 (second best), institutional controls is ranked 3 (third best), and NAI is ranked 4 (last).

Community Acceptance. Based on interaction with the community during the Phase II EE/CA investigation and during RAB meetings, the community is likely to consider a subsurface clearance to depth of detection as the most acceptable alternative for Area T based on the moderate OE hazard level, planned future development for this area, and the accessibility of the area to the general public; therefore, subsurface clearance to depth of detection is ranked 1 (best) in terms of local agency acceptance. The community would be more likely to consider a surface clearance over institutional controls or NAI, due to the moderate OE hazard level in this area and the future development planed for this area; therefore, surface clearance is ranked 2 (second best), institutional controls is ranked 3 (third best), and NAI is ranked 4 (last).

8.3.9.4 Overall Implementability Ranking for Alternatives 1 through 4.

Surface Clearance of OE (Alternative 3) and NAI (Alternative 1) are both ranked as the best overall OE response action alternatives in terms of implementability for Area T (see Table 8-79). Although NAI tied as the best alternative in terms of implementability, it is not considered by local agencies or the community as an acceptable or appropriate OE response action alternative for Area T, due to the moderate OE hazard level in this area and the future development of this area. Subsurface Clearance of OE to Depth of Detection (Alternative 4) is ranked 3 (third best), based on technical and administrative feasibility issues and the lack

of immediate availability of services and materials. Institutional Controls (Alternative 2) is ranked 4 (last), based on technical and administrative feasibility issues and its lack of acceptance by local agencies and the community as an effective stand-alone alternative.

8.3.9.5 Cost.

Table 8-80 provides the cost criteria of the four alternatives for Area T. The evaluation of each of these alternatives is presented below.

Table 8-80. Cost Criteria Evaluation for Area T

Alternative	Cost	Investment	Benefit	Score	Rank
1, No Action Indicated (NAI)	$0	1	4	5	3
2, Institutional Controls	$667,737	2	2	4	1
3, Surface Clearance	$4,505,905	3	1	4	1
4, Subsurface Clearance to Depth	$44,714,786	4	3	7	4

Note: Ranking from best to worst; best = 1.

Investment and Benefit. There is no cost associated with NAI; therefore, NAI ranked 1 (best) in terms of investment. The alternative that provides the greatest benefit, in terms of dollars spent to effect results, appears to be the surface clearance. Institutional controls is ranked 2 (second best) because it offers the opportunity to educate the community concerning the danger associated with OE in this area and has the potential to offer a reduction in the potential for OE exposure similar to that of a surface clearance. Subsurface clearance to depth of detection is ranked 3 (third best) due to the cost. NAI is ranked 4 (last) because it would offer no benefit in terms of reduction of exposure to OE.

8.3.9.6 Overall Cost Ranking for Alternatives 1 through 4.

Institutional Controls (Alternative 2) and Surface Clearance of OE (Alternative 3) are both ranked as the most acceptable alternatives in terms of cost for Area T. Both of these alternatives offer the ability to reduce the potential for exposure to OE in terms of cost benefit and investment. NAI (Alternative 1) is ranked 3 (third best) because it would offer no reduction in the potential for exposure to OE. Subsurface Clearance of OE to Depth of Detection (Alternative 4) is ranked 4 (last) because the high cost of this alternative far outweighs the benefit in reduction to be gained as a result of implementation.

8.3.9.7 Overall Ranking of Alternatives for Area T.

The overall ranking of the different alternatives in terms of their effectiveness, implementability, and cost is presented in Table 8-81. The alternative with the lowest score is considered best for each criterion (effectiveness, implementability, and cost) evaluated.

Table 8-81. Alternative Evaluation for Area T

Alternative	Effectiveness Rank	Implementability Rank	Cost Rank	Overall Score	Overall Rank
1, No Action Indicated (NAI)	4	1	3	8	2
2, Institutional Controls	3	4	1	8	2
3, Surface Clearance	2	1	1	4	1
4, Subsurface Clearance to Depth	1	3	4	8	2

Note: Ranking from best to worst; best = 1.

Surface Clearance of OE (Alternative 3) is ranked as the best overall OE response action alternative for Area T due to the moderate OE hazard level in this area, the accessibility of the area to the general public, and the future development that is planned for this area. NAI (Alternative 1), Institutional Controls (Alternative 2), and Subsurface Clearance of OE to Depth of Detection (Alternative 4) are all ranked 2 (second best), behind the surface clearance. Specific recommendations for Area T are made in Chapter 9.0, Recommended OE Response Action Alternatives.

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