DOCUMENTATION OF ENVIRONMENTAL INDICATOR DETERMINATION

Interim Final 2/5/99

RCRA Corrective Action
Environmental Indicator (EI) RCRIS code (CA725)
Current Human Exposures Under Control

Facility Name: **The Ensign-Bickford Company**
Facility Address: **8305 South Highway 6, Spanish Fork, Utah 84660-0310**
Facility EPA ID #: **UTD041310962**

1. Has **all** available relevant/significant information on known and reasonably suspected releases to soil, groundwater, surface water/sediments, and air, subject to RCRA Corrective Action (e.g., from Solid Waste Management Units (SWMU), Regulated Units (RU), and Areas of Concern (AOC)), been **considered** in this EI determination?

__**Yes**_ If yes - check here and continue with #2 below.

_____ If no - re-evaluate existing data, or

_____ if data are not available skip to #6 and enter"IN" (more information needed) status code.

BACKGROUND

Definition of Environmental Indicators (for the RCRA Corrective Action)

Environmental Indicators (EI) are measures being used by the RCRA Corrective Action program to go beyond programmatic activity measures (e.g., reports received and approved, etc.) to track changes in the quality of the environment. The two EI developed to-date indicate the quality of the environment in relation to current human exposures to contamination and the migration of contaminated groundwater. An EI for non-human (ecological) receptors is intended to be developed in the future.

Definition of "Current Human Exposures Under Control" EI

A positive "Current Human Exposures Under Control" EI determination ("YE" status code) indicates that there are no "unacceptable" human exposures to "contamination" (i.e., contaminants in concentrations in excess of appropriate risk-based levels) that can be reasonably expected under current land- and groundwater-use conditions (for all "contamination" subject to RCRA corrective action at or from the identified facility (i.e., site-wide)).

Relationship of EI to Final Remedies

While Final remedies remain the long-term objective of the RCRA Corrective Action program the EI are near-term objectives which are currently being used as Program measures for the Government Performance and Results Act of 1993, GPRA). The "Current Human Exposures Under Control" EI are for reasonably expected human exposures under current land- and groundwater-use conditions ONLY, and do not consider potential future land- or groundwater-use conditions or ecological receptors. The RCRA Corrective Action program's overall mission to protect human health and the environment requires that Final remedies address these issues (i.e., potential future human exposure scenarios, future land and groundwater uses, and ecological receptors).

Duration / Applicability of EI Determinations

EI Determinations status codes should remain in RCRIS national database ONLY as long as they remain true (i.e., RCRIS status codes must be changed when the regulatory authorities become aware of contrary information).

2. Are groundwater, soil, surface water, sediments, or air **media** known or reasonably suspected to be **"contaminated"**[1] above appropriately protective risk-based "level" (applicable promulgated standards, as well as other appropriate standards, guidelines, guidance, or criteria) from releases subject to RCRA Corrective Action (from SWMUs, RUs or AOCs)?

	Yes	No	?	Rationale / Key Contaminants
Groundwater	_x_	___	___	**Groundwater is contaminated with RDX, PETN, ...**
Air (indoors)[2]	___	_x_	___	**Airborne may be in production areas (OSHA)**
Surface Soil (e.g., <2 ft)		_x_	___	___ **44 SWMUs on site, many contaminated**
Surface Water	___	_x_	__	**SWMU 16, a small ephemeral pond, most times dry**
Sediment	___	_x_	___	**SWMU 16, contamination below risk-levels**
Subsurf. Soil (e.g., >2 ft)	_y_		___	__ **PETN, RDX, TNT, etc. and hydrocarbons**
Air (outdoors)	___	_x__		

_____ If no (for all media) - skip to #6, and enter "YE," status code after providing or citing appropriate "levels," and referencing sufficient supporting documentation demonstrating that these "level" are not exceeded.

__x__ If yes (for any media) - continue after identifying key contaminants in each "contaminated" medium, citing appropriate "level" (or provide an explanation for the determination that the medium could pose an unacceptable risk), and referencing supporting documentation.

_____ If unknown (for any media) - skip to #6 and enter "IN" status code.

Footnotes:

[1] "Contamination" and "contaminated" describes media containing contaminants (in any form, NAPL and/or dissolved, vapors, or solids, that are subject to RCRA) in concentrations in excess of appropriately protective risk-based "level" (for the media, that identify risks within the acceptable risk range).

[2] Recent evidence (from the Colorado Dept. of Public Health and Environment, and others) suggest that unacceptable indoor air concentrations are more common in structures above groundwater with volatile contaminants than previously believed. This is a rapidly developing field and reviewers are encouraged to look to the latest guidance for the appropriate methods and scale of demonstration necessary to be reasonably certain that indoor air (in structures located above (and adjacent to) groundwater with volatile contaminants) does not present unacceptable risks.

Rationale and Reference(s):

There are two significantly different potential human receptors, namely, on-site workers and off-site residents, who are potentially exposed to the contaminated media caused by waste releases at the EBCO facility. On-site and off-site contaminations are addressed by the following two different programs: (1) the Utah Division of Solid and Hazardous Waste (DSHW) is overseeing the on-site RCRA Facility Investigation (RFI), and (2) the Utah Division of Water Quality is responsible for the oversight of off-site groundwater contamination that was initiated years before RFI activities. Therefore, the rationale and references for this EI are focused on the two different human receptors.

1) On-site: RCRA Facility Investigation (RFI) Activities

The Ensign-Bickford Company (EBCO) continues to conduct RFI activities following the Final Revised RFI work plan approved by the Utah Division of Solid and Hazardous Waste (DSHW) in June 1999 in accordance with Stipulation and Consent Agreement No. 9412069 between EBCO and DSHW (representing Utah Solid and Hazardous Waste Control Board). The RFI activities include the following: a) Investigate the nature and extent of known and suspected releases of hazardous wastes and hazardous waste constituents and identify potential source areas to the regional groundwater contamination; b) Evaluate the risks associated with any contamination; and c) Develop appropriate site management options including methods for cleaning up contamination at the facility.

The on-site soil and installation of groundwater monitoring wells has largely been completed. Sampling results indicate that many SWMUs have been impacted with constituents of energetic materials (CEMs) or explosive constituents (e.g., TNT, PETN, RDX, HMX, NG, etc.), lead, or some organic compounds associated with petroleum hydrocarbons and laboratory solvents. Lesser amounts of other compounds such as lead and certain solvents have also been found in soil, but typically not in ground water.

The most significant source of contaminants was the waste water discharge from various former explosive manufacturing areas into unlined surface impoundments, especially the north dispersion area (SWMU 1), and the former manufacturing complexes (SWMUs 26 and 30), and lined acid ponds (SWMU 3). Some of the SWMUs are believed to have contributed to the explosive contamination found in the regional aquifer, primarily off-site.

Surface soils at several of the SWMUs contain elevated levels of various contaminants that exceed the site-specific industrial risk levels, or risk-based screening levels (RBSLs) developed in the RFI work plan. According to the work plan, all these areas will need to be remediated or managed to ensure contaminants in environmental media will not pose a risk to on-site workers.

The only surface water and sediment contamination present was at SWMU 16, which consists of a small former QC Test Pond (approximately 40' x 40') where explosives products were historically tested. The QC Test Pond is ephemeral and dry at most times. EBCO stopped testing its product in the pond several years ago. The pond has been dry the last several years. RFI analytical results report low concentrations of CEMs in surface and subsurface soils below the base of the pond. These samples were collected when the pond was dry. When the pond was wet, these soils could be interpreted to be sediment. However, for evaluating human health risks, soils on the pond bottom are best characterized as surface soil. The COCs in surface soil samples from the QC Pond were not present above their respective site-specific, risk-based soil screening levels (RBSLs) (Montgomery Watson, 2001). Although low levels of CEMs were detected from water in the pond when it was wet (e.g., 11 ug/L (ppb) of RDX), it is unlikely that there is an exposure pathway from the surface water and sediment contamination to facility workers or on-site human receptors.

Impacts from past releases of contaminants to indoor air are most commonly associated with the volatilization of volatile organic compounds (VOCs) present in ground water or soil beneath or near structures. VOCs are not known to be present in off-site ground water near the facility. VOC

concentrations found in on-site ground water and soil are very low and these detections were not in locations or depths that would be likely to impact existing structures (Montgomery Watson, 2000; Montgomery Watson, 2001).

Impacts from past releases of contaminants to outdoor air are reasonably assumed negligible. This is because VOCs are not present in surface soil at concentrations that exceed RBSLs which include a vapor inhalation pathway. There should be no excess risk posed to current site users from vapors on the surface. Construction workers could be exposed to VOC vapors in a trench. Since there are a limited number of subsurface soil samples that indicated 1,2,4-Trimethylbenzene concentrations greater than the construction worker screening level (Montgomery Watson, 2001), construction workers could be exposed to this compound above the appropriate risk-based threshold (due to the combined ingestion, inhalation and dermal absorption pathways). Workers could also inhale dust containing COCs that were found to exceed soil screening levels in surface and subsurface soil. However, both the cancer and non-cancer risk attributable to inhalation of particles and vapors is many orders of magnitude lower than the risk attributable to direct ingestion of soil. Therefore, the risk posed by inhalation of outdoor air is assumed negligible.

Facility production wells are not impacted with CEMs or other contaminants. Therefore, there is no groundwater exposure pathway to on-site human receptors.

References (Available at the DSHW office):
- Final Revised RFI Work Plan Quality Assurance Program (Volume I) and Field Sampling Program (Volume II), December 1998 (Montgomery Watson).
- Monitoring Well Installation and Groundwater Sampling, Field Program Addendum in October 2000, and Second Phase in March 2001 Montgomery Watson).
- Lysimeter Installation and Vadose Zone Sampling Work Plan Addendum, July 2001 (Montgomery Watson).
- SWMU-Specific Figures and Data Tables from Surface Soil, Soil Boring, and Trenching Locations, July 2000 (Montgomery Watson).
- SWMU-Specific Figures and Data Tables from Supplementary Surface Soil, Soil Boring, and Trenching Locations, May 2001 (Montgomery Watson).
- DSHW's comments and correspondence on EBCO's various work plans, reports and submittals.

2) Off-site Groundwater Contamination and Remediation

Following the failure of the acid ponds that were used to store and evaporate spent nitric acid (containing low levels of CEMs) from explosive production in 1986, EBCO (formerly Trojan Company) conducted investigations of elevated nitrate concentrations present in the Mapleton City municipal and some residential drinking water wells. Since then, EBCO has performed various phases of hydrogeologic investigations in the area of impact in accordance with the provisions of the Consent Agreement between the Utah Division of Water Quality (DWQ) and EBCO under the framework of the Clean Water Act.

Although RDX and other CEMs were likely present in the regional groundwater, these constituents were not detected in private wells, municipal wells and monitoring wells until 1994 after using an improved EPA method for explosive analysis. The area of groundwater impact is approximately three-mile long and one-mile wide. Please note that RCRA corrective action is not addressing off-site groundwater contamination because nitrate in the groundwater is not a hazardous waste and the low levels of CEMs in the groundwater are no longer reactive and therefore are not hazardous wastes.

Since 1998, three granular active carbon (GAC) pump-and-treat systems with a total of five extraction wells have been installed to treat and contain the groundwater plume. The combined total groundwater extraction rate is approximately 2000 to 2500 gpm. Treated groundwater is discharged to Hobble Creek, and is also used as secondary irrigation water for some residents' lawns during summer months. The

discharge water from the three GAC systems is tested every month to ensure that a GAC breakthrough or a treatment system failure has not occurred.

Presently, all residents within the area of impact have stopped using private wells for drinking water. Instead, EBCO has financed connecting all impacted Mapleton residents to the non-impacted Mapleton municipal drinking water system. The DWQ has also sent letters of warning to all impacted residents about the potential risks from using the contaminated groundwater for irrigating, or watering gardens. Therefore, unless the residents have ignored the warning, there should be no direct human exposure from contaminated groundwater in this area.

In addition, based on a thorough telephone survey conducted by DSHW staff in 2004, none of private well owners are currently using contaminated groundwater to irrigate produce or crops (directly consumed by humans). Some residents in the area of contamination are using the contaminated groundwater to water alfalfa consumed by livestock. Based on the currently available information, the potential concentration of RDX in beef from cows fed forage irrigated with contaminated water is judged unlikely to cause adverse health effects in humans. While no direct information is available regarding the accumulation of RDX from feed to cattle to humans, data is available that shows that RDX is metabolized by mammals such as humans and rats (ATSDR Toxicological Profile). Chemicals that are readily metabolized do not bioaccumulate. The potential for RDX to accumulate in beef is judged low because the RDX concentrations in groundwater are low (<30 ug/l), the amount of RDX transferred to plant matter is predicted to be 3 mg/kg, and cattle are presumed to metabolize RDX. Beef cattle are usually fed alternative feeds (e.g., grain) prior to slaughter that would give the cow additional time to depurate if the feed is uncontaminated.

Reference (Available at the DWQ office):

- Corrective Action Plan, July 2001 (under review) (Charter Oak Environmental).

- Hydrology and simulation of ground water flow in the southern Utah and Goshen Valleys, 1995, (Brooks, L.E. and B.J. Stolp):, Utah: United States Geological Survey in cooperation with the Utah Department of Natural Resources Division of Water Rights, Utah DNR Technical Publication No. 111.
- The Geology of North America (Mifflin, M.D.) 1998, Vol. O-2, Hydrogeology, Chapter 8, Region 5, Great Basin: The Geological Society of America.
- Quarterly Reports and 1999 Annual Report for recovery system performance, general water quality, and potentiometric data (Charter Oak Environmental).
- Well Head Protection Plan, 1998 (Charter Oak Environmental).
- R-1, R-2 and Orton-23 Well Construction and Pump Test Reports, 1998 (Charter Oak Environmental).
- Nitrate and RDX Distribution and Fate Report (Charter Oak Environmental).
- Data Collection Plan, 1998 (Charter Oak Environmental).
- An Evaluation of Wastewater Management Alternatives, 1997 (Consulting Environmental Engineering).
- R-3 Well Construction and Pump Test, 1997 (Owens Western Company).
- Supplemental Hydrogeologic Investigation Report, 1996 (Owens Western Company).
- Phases Ia, Ib, II, III and IV Hydrogeologic Investigation Reports, 1992-1995, and Hydrogeologic Investigation Plan 1991 (Owens Western Company).
- Hydogeologic Assessment Program, 1989 and 1990 (Engineering Science).
- A Hydrogeologic Evaluation of the IMC Springville Plant Site, Utah, Phase I (1979); Preliminary Investigation of Waste Management at the IMC Springville Plant, Phase II (1980); A Hydrogeologic Evaluation of the IMC Springville Plant Site, Utah, Phase III (1981); and Hydrogeologic Evaluation of the IMC Springville Plant Site, Utah, Phase IV (1981) (PE LaMoreaux & Associates).

3. Are there **complete pathways** between "contamination" and human receptors such that exposures can be reasonably expected under the current (land- and groundwater-use) conditions?

Summary Exposure Pathway Evaluation Table

	Potential **Human Receptors** (Under Current Conditions)						
"contaminated" Media	Residents	Workers	Day-Care	Construction	Trespassers	Recreation	Food[3]
Groundwater	**Yes**	No	No	No	No	No	**Yes**
Air (indoors)	No	No	No	No	No	No	No
Soil (surface, e.g., <2 ft)	No	**Yes**	No	**Yes**	**Yes**	No	No
Surface Water	No	No	No	No	No	No	No
Sediment	No	No	No	No	No	No	No
Soil (subsurface e.g., >2 ft)	No	**Yes**	No	**Yes**	No	No	No
Air (outdoor)	No	No	No	No	No	No	No

Instructions for Summary Exposure Pathway Evaluation Table:

1. Strike-out specific Media including Human Receptors' spaces for Media which are not "contaminated") as identified in #2 above.

2. enter "Yes" or "No" for potential "completeness" under each "contaminated" Media -- Human Receptor combination (Pathway).

Note: In order to focus the evaluation to the most probable combinations some potential "contaminated" Media - Human Receptor combinations (Pathways) do not have check spaces ("___"). While these combinations may not be probable in most situations they may be possible in some settings and should be added as necessary.

_____ If no (pathways are not complete for any contaminated media-receptor combination) - skip to #6, and enter "YE" status code, after explaining and/or referencing condition(s) in-place, whether natural or man-made, preventing a complete exposure pathway from each contaminated medium (e.g., use optional Pathway Evaluation Work Sheet to analyze major pathways).

Yes If yes (pathways are complete for any "contaminated" Media - Human Receptor combination) - continue after providing supporting explanation.

_____ If unknown (for any "contaminated" Media - Human Receptor combination) - skip to #6 and enter "IN" status code

[3] Indirect Pathway/Receptor (e.g., vegetables, fruits, crops, meat and dairy products, fish, shellfish, etc.)

Footnote:
[3] Indirect Pathway/Receptor (e.g., vegetables, fruits, crops, meat and dairy products, fish, shellfish, etc.)

Rationale and Reference(s):

Table 1 lists the rationale and references for potential human exposures from contaminated media (ground water and soil) that exceed acceptable risk levels. As can be seen from the Summary Exposure Pathway Evaluation Table and Table 1, the only potential groundwater exposure to human receptors under current conditions is from livestock feed to cattle and then to human. As explained in the previous rationale and references to Question 2, the available information indicates that the pathway is unlikely to cause adverse health effects in humans.

Contaminated surface and subsurface soils could potentially expose on-site workers (facility employees and construction workers). However, facility routine production activities do not involve the use of areas where soils contain COCs above RBCLs. The facility health and safety plan prohibits workers from entering these areas unprotected.

Table 1. Rationale and References for Potential Human Receptors Under Current Conditions

"contaminated" media	Residents	Workers	Day-Care	Construction	Trespasser	Recreation	Food[3]
Groundwater	*Yes.* *Off-site residents have been supplied with a non-impacted drinking water source. The only potential exposure for off-site residents is through the food pathway (from livestock feed to cattle and then to human.) The available information indicates that the pathway is unlikely to cause adverse health effects in humans. (see Food column).* *EBCO and the Utah Department of Environmental Quality (DEQ) have surveyed ground water use within the affected area. DEQ has contacted residents in the area and has repeatedly advised them not to use impacted ground water for drinking purposes.*	*No.* *The water supply for site workers is not impacted and does not contain Chemical of Concerns (COCs).*	*No.* *It is unlikely that exposure from the deep ground water (known to be impacted by COCs is at least 70 feet below surface) to day-care facilities is complete.* *A review of Utah State day-care licensing records (http://hlunix.hl.state.ut.us/hsi/hfl/cc.htm) showed only two licensed day care facilities in Mapleton. Neither of these was in areas where ground water is impacted by COCs.*	*No.* *The shallowest significant ground water known to be impacted by COCs is at least 70 feet below surface. There is little or no reasonable opportunity for construction workers to contact ground water at this depth.*	*No.* *There is no reasonable means for a trespasser to contact impacted ground water*	*No.* *There is no reasonable means for a recreationist to contact impacted ground water.*	*Yes.* *Off-site residents with private wells located where ground water is impacted by COCs are irrigating crops, alfalfa, e.g., that will be fed to livestock. The only potential groundwater exposure to human receptors under current conditions is from livestock feed to cattle and then to humans. The available information indicates that the pathway is unlikely to cause adverse health effects in humans.*

Table 1 continued. Rationale and References for Potential Human Receptors Under Current Conditions

"contaminated" media	Residents	Workers	Day-Care	Construction	Trespasser	Recreation	Food[3]
Soil (surface, e.g. < 2 ft)	*No.* *Impacted soils are only known to exist on site.*	*Yes.* *On-site workers may enter areas where surface soils are impacted with COCs. RFI sampling results indicate that soil contamination at approximately six SWMUs may exceed in surface soils the industrial risk screening levels established in the RFI work plan, such as, SWMUs 1, 5, 6, 18, 30 and 31. SWMUs 5 and 6 are close to current facility production areas where workers must wear personal protective clothing and equipment.*	*No.* *Impacted soils are only known to exist on site. There is no day-care facility on site.*	*Yes.* *On-site construction workers may work in areas where surface soils are impacted with COCs.*	*Yes.* *Trespassers could enter the wastewater dispersion area of SWMU 1. Access by trespassers to other areas with impacted soils is adequately restricted by the facility fence and regular security patrols.*	*No.* *A recreationist could enter the wastewater dispersion area of SWMU 1. However, this would be trespassing, so this potential entry is covered under the "trespasser" column.*	*No.* *Impacted soils are only known to exist on site. There is no production of food crops on site.*

Table 1 continued. Rationale and References for Potential Human Receptors Under Current Conditions

"contaminated" media	Residents	Workers	Day-Care	Construction	Trespasser	Recreation	Food[3]
Soil (subsurface, e.g>2ft)	*No.* *Impacted soils are only known to exist on site.*	*Yes.* *Regular production activity by site workers does not involve coming in contact with subsurface soils. However, the nitrostarch layer in SMWU 26 could pose a reactivity/ ignitability hazard to workers in close proximity.*	*No.* *Impacted soils are only known to exist on site. There is no day-care facility on-site.*	*Yes.* *On-site construction workers may work in areas where subsurface soils are impacted with COCs. Also, construction workers could work in areas where the presence of nitrostarch poses a reactivity/ ignitability hazard.*	*No.* *There is no reasonable scenario where a trespasser could contact subsurface soil. Also, site security is adequate to restrict access to the nitrostarch areas (SWMU 26 and 27).*	*No.* *There is no reasonable scenario where a recreationist could contact subsurface soil.*	*No.* *Impacted soils are only known to exist on site. There is no production of food crops on site. Furthermore, the root zone of most food crops would typically be less than two feet.*

4 Can the **exposures** from any of the complete pathways identified in #3 be reasonably expected to be sss **"significant"**[4] (i.e., potentially "unacceptable" because exposures can be reasonably expected to be: 1) greater in magnitude (intensity, frequency and/or duration) than assumed in the derivation of the acceptable "level" (used to identify the "contamination"); or 2) the combination of exposure magnitude (perhaps even though low) and contaminant concentrations (which may be substantially above the acceptable "level") could result in greater than acceptable risks)?

__**No**__ If no (exposures can not be reasonably expected to be significant (i.e., potentially "unacceptable") for any complete exposure pathway) - skip to #6 and enter "YE" status code after explaining and/or referencing documentation justifying why the exposures (from each of the complete pathways) to "contamination" (identified in #3) are not expected to be "significant."

_____ If yes (exposures could be reasonably expected to be "significant" (i.e., potentially "unacceptable") for any complete exposure pathway) - continue after providing a description (of each potentially "unacceptable"exposure pathway) and explaining and/or referencing documentation justifying why the exposures (from each of the remaining complete pathways) to "contamination" (identified in #3) are not expected to be "significant."

_____ If unknown (for any complete pathway) - skip to #6 and enter "IN" status code

[4] If there is any question on whether the identified exposures are "significant" (i.e., potentially "unacceptable") consult a human health Risk Assessment specialist with appropriate education, training and experience.

Rationale and Reference(s):

As mentioned in Question 2 of the EI form, there are two different potential human receptors, off-site and on-site receptors, which are considered for this EI.

(1) Off-site human receptors are residents within the area of the groundwater impact. Through an ongoing institutional controls program, impacted residents have been provided with clean drinking water sources to their houses, and they have also been advised not to use their own well water for drinking water purposes. Through periodic monitoring of the institutional controls program, it has been ascertained that potential uses of impacted ground water by off-site residents is limited to irrigation of lawns and gardens under current conditions. Currently, only potential groundwater exposure to human receptors is from livestock feed to cattle and then to humans. As explained in the previous rationale and references to Question 2, the available information indicates that the pathway is unlikely to cause adverse health effects in humans. Therefore, all potential exposures cannot be reasonably expected to be significant (i.e., potentially "unacceptable") for any complete exposure pathway.

(2) On-site human receptors are facility employees and construction workers. The following are rationales and references as to why exposure cannot be reasonably expected to be significant for on-site workers through only those pathways indicated as potentially complete. A "YE" status code can be entered for on-site human receptors.

(a) Surface Soil (<2 feet)

RFI sampling results indicate that surface soil contamination at approximately six SWMUs may exceed the industrial risk-based screening levels (RBSLs) established in the RFI work plan. EBCO has an internal site health and safety plan that restricts personal access to areas where soil are knows to be contaminated. EBCO has also proposed interim remedial measures at some of these SWMUs, such as,

SWMUs 5 and 6 that are close to the current facility production areas. No detailed work plans or schedules have been proposed to accomplish these remedial measures. Final remedies as part of EBCO RFI activities will address the RCRA corrective action program's overall long-term mission to protect human health and the environment.

Workers: Routine production activities do not involve the use of areas where surface soils contain COCs above industrial-worker risk-based screening levels (RBSLs). Worker access to these contaminated areas is restricted by the facility health and safety plan. Entry into these areas is typically limited to HAZMAT trained workers with the knowledge and equipment to adequately control exposure to COCs. The time any non-HAZMAT workers spend in the area would be far below the exposure time assumed in the calculation of the industrial-worker RBSLs (8 hours/day and 250 days/year for 25 years). Therefore, the potential exposure and associated risk for non-HAZMAT workers is assumed to be very low.

Construction: There is no ongoing or planned construction work in areas that contain COCs above construction-worker RBSLs. In the unlikely case that construction were to be performed in such areas prior to soil remediation, the construction activities would be performed by HAZMAT trained workers with the knowledge and equipment to adequately control exposure to COCs.

Trespassers: The only area currently impacted by COCs that could reasonably be accessed by a trespasser is the wastewater dispersion area (SWMU 1). Access to this area is controlled by a low barbwire fence with "no trespassing" signs. However, a trespasser could access this area. The remainder of the facility is protected by a six-foot chain-link fence topped with three strands of barbwire. SWMU 1 is patrolled periodically by site security personnel and trespasser entry into this area has not been reported.

Site-specific risk based screening levels for trespassers have not been calculated. However, the cumulative risk indices calculated for SWMU 1 are less than three times the acceptable levels for a site worker. The exposure time assumptions for the site-worker RBSL (250 days/year for 25 years) is far greater than the exposure time that could reasonably be expected for a trespasser and more than off-sets the exposure represented by the soil concentrations alone. Therefore, the potential exposure and associated risk for a trespasser is assumed to be very low.

(b) Subsurface Soil (>2 feet)

Workers: Subsurface soil sampling indicates a potential risk to site workers from the presence of potentially reactive concentrations of nitrostarch in SMWU 26 and SMWU 27. Although site workers would not directly contact this material, a reactivity/ignitability hazard could exist to workers in close proximity to the nitrostarch areas. This hazard has been mitigated through establishing a no-entry zone around the nitrostarch areas and maintaining adequate escape routes. The no-entry zones and escape routes are reinforced through worker training.

Construction: There is no ongoing or planned construction work in areas that contain COCs above construction-worker RBSLs. In the unlikely case that construction were to be performed in such areas prior to soil remediation, the construction activities would be performed by HAZMAT trained workers with the knowledge and equipment to adequately control exposure to COCs. Construction work is not permitted in areas containing potentially reactive/ignitable concentrations of nitrostarch (partial SWMUs 26 and 27). The prohibition on construction work in these areas is reinforced through employee training.

5 Can the "significant" **exposures** (identified in #4) be shown to be within **acceptable** limits?

__**YE**__ If yes (all "significant" exposures have been shown to be within acceptable limits) - continue and enter "YE" after summarizing and referencing documentation justifying why all "significant" exposures to "contamination" are within acceptable limits (e.g., a site-specific Human Health Risk Assessment).

_____ If no (there are current exposures that can be reasonably expected to be "unacceptable")- continue and enter "NO" status code after providing a description of each potentially "unacceptable" exposure.

_____ If unknown (for any potentially "unacceptable" exposure) - continue and enter "IN" status code

Rationale and Reference(s):

YE - all "significant" exposures from the groundwater to off-site residents have been shown to be within acceptable limits.

Also, all "significant" exposures from contaminated soils to on-site workers have been shown to be within acceptable limits. Facility routine production activities do not involve the use of the contaminated areas above the RBSLs. The facility safety plan also prohibits on-site workers from entering, without adequate protections, the areas of contamination that exceed the RBSLs. However, in accordance with R315-101 of Utah Administrative Code, EBCO is required to conduct appropriate site management activities including remedial actions, if necessary, to mitigate risks exceeding RBSLs to on-site workers. According to the approved RFI work plan, EBCO will propose detailed work plans on how to meet this requirement.

6. Check the appropriate RCRIS status codes for the Current Human Exposures Under Control EI event code (CA725), and obtain Supervisor (or appropriate Manager) signature and date on the EI determination below (and attach appropriate supporting documentation as well as a map of the facility):

_YE__ YE - Yes, "Current Human Exposures Under Control"has been verified. Based on a review of the information contained in this EI Determination, "Current Human Exposures" are expected to be "Under Control" at **The Ensign-Bickford Company** facility , EPA ID **# UTD041310962**, located at **8305 South Highway 6, Spanish Fork, Utah** under current and reasonably expected conditions. This determination will be re-evaluated when the Agency/State becomes aware of significant changes at the facility.

____ NO - "Current Human Exposures" are NOT "Under Control."

____ IN - More information is needed to make a determination

(Note that an "IN" is entered because environmental exposures to off-site residents are currently under review. An "YE" code is appropriate for on-site workers at this time.)

Completed by (signature) _____ Date September 17, 2004
(print) Hao Zhu
(title) Environmental Engineer

Supervisor (signature) _____ Date September 17, 2004
(print) Brad Maulding
(title) Section Manager
(EPA Region or State) Utah DEQ

Locations where References may be found:

1) Off-site groundwater:
Utah Division of Water Quality
Cannon Health Building, 3rd Floor
288 North 1460 West
Salt Lake City, UT 84114-4870

2) On-site RFI activities:
Utah Division of Solid and Hazardous Waste
Cannon Health Building, 4th Floor
288 North 1460 West
Salt Lake Cit, UT 84114-4880

Contact telephone and e-mail numbers

(name) Hao Zhu (at the DSHW office)
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FINAL NOTE: THE HUMAN EXPOSURES EI IS A QUALITATIVE SCREENING OF EXPOSURES AND THE DETERMINATIONS WITHIN THIS DOCUMENT SHOULD NOT BE USED AS THE SOLE BASIS FOR RESTRICTING THE SCOPE OF MORE DETAILED (E.G., SITE-SPECIFIC) ASSESSMENTS OF RISK.

DOCUMENTATION OF ENVIRONMENTAL INDICATOR DETERMINATION

Interim Final 2/5/99

RCRA Corrective Action
Environmental Indicator (EI) RCRIS code (CA750)
Migration of Contaminated Groundwater Under Control

Facility Name: **The Ensign-Bickford Company**
Facility Address: **8305 South Highway 6, Spanish Fork, Utah 84660-0310**
Facility EPA ID #: **UTD041310962**

1. Has **all** available relevant/significant information on known and reasonably suspected releases to the groundwater media, subject to RCRA Corrective Action (e.g., from Solid Waste Management Units (SWMU), Regulated Units (RU), and Areas of Concern (AOC)), been **considered** in this EI determination?

__X__ If yes - check here and continue with #2 below.

_____ If no - re-evaluate existing data, or

_____ if data are not available, skip to #8 and enter"IN" (more information needed) status code.

BACKGROUND

Definition of Environmental Indicators (for the RCRA Corrective Action)

Environmental Indicators (EI) are measures being used by the RCRA Corrective Action program to go beyond programmatic activity measures (e.g., reports received and approved, etc.) to track changes in the quality of the environment. The two EI developed to-date indicate the quality of the environment in relation to current human exposures to contamination and the migration of contaminated groundwater. An EI for non-human (ecological) receptors is intended to be developed in the future.

Definition of "Migration of Contaminated Groundwater Under Control" EI

A positive "Migration of Contaminated Groundwater Under Control" EI determination ("YE" status code) indicates that the migration of "contaminated" groundwater has stabilized, and that monitoring will be conducted to confirm that contaminated groundwater remains within the original "area of contaminated groundwater"(for all groundwater "contamination" subject to RCRA corrective action at or from the identified facility (i.e., site-wide)).

Relationship of EI to Final Remedies

While Final remedies remain the long-term objective of the RCRA Corrective Action program the EI are near-term objectives which are currently being used as Program measures for the Government Performance and Results Act of 1993, GPRA). The "Migration of Contaminated Groundwater Under Control" EI pertains ONLY to the physical migration (i.e., further spread) of contaminated ground water and contaminants within groundwater (e.g., non-aqueous phase liquids or NAPLs). Achieving this EI does not substitute for achieving other stabilization or final remedy requirements and expectations associated with sources of contamination and the need to restore, wherever practicable, contaminated groundwater to be suitable for its designated current and future uses.

Duration / Applicability of EI Determinations

EI Determinations status codes should remain in RCRIS national database ONLY as long as they remain true (i.e., RCRIS status codes must be changed when the regulatory authorities become aware of contrary information).

2. Is **groundwater** known or reasonably suspected to be **"contaminated"** [1] above appropriately protective "level" (i.e., applicable promulgated standards, as well as other appropriate standards, guidelines, guidance, or criteria) from releases subject to RCRA Corrective Action, anywhere at, or from, the facility?

__x__ If yes - continue after identifying key contaminants, citing appropriate "levels," and referencing supporting documentation.

_____ If no - skip to #8 and enter "YE" status code, after citing appropriate "levels," and referencing supporting documentation to demonstrate that groundwater is not "contaminated."

_____ If unknown - skip to #8 and enter "IN" status code.

Footnotes:

[1] "Contamination" and "contaminated" describes media containing contaminants (in any form, NAPL and/or dissolved, vapors, or solids, that are subject to RCRA) in concentrations in excess of appropriate "level" (appropriate for the protection of the groundwater resource and its beneficial uses).

Rationale and Reference(s):

The groundwater was first known to have been contaminated with elevated nitrate in 1986 when the facility waste acid surface impoundment failed releasing spent nitric acid into the subsurface. Constituents of energetic materials (CEMs), such as RDX, PETN, TNT, etc. were detected in municipal, private and monitoring wells in 1994 using an EPA analytical method that was able to achieve a lower detection limit. Preliminary RCRA Facility Investigation (RFI) data indicate the former unlined waste water impoundments and acid ponds may be the primary sources to the groundwater contamination that is approximately three miles long and one mile wide (see the attached Nitrate-Nitrogen and RDX Approximate Distribution Map 2000). EBCO no-longer discharges production related waste water on to the surface soil or into ponds. Since 1991, all waste waters have been treated in the facility waste water treatment system before discharging to a POTW.

EBCO has performed various phases of hydrogeologic investigations in the area of impact in accordance with the provisions of the consent agreement between the Utah Division of Water Quality (DWQ) and EBCO under the framework of the Clean Water Act. The area of study approximately encompasses a region of five miles long and two miles wide as depicted in Figure 6.3 Study Area Topography (the figure number is as presented in the CAP and are presented in numerical order).

EBCO has installed a pump-and-treat system composed of three granular active carbon (GAC) with a total of five extraction wells to treat and contain the groundwater plume. The combined total groundwater extraction rate is approximately 2200 to 2500 gpm. Treated groundwater is discharged to the Hobble Creek, and is also used as secondary irrigation water for residents' lawns during the summer months.

The RDX concentrations within the area of impact range from approximately 2 to 30 µg/L (ppb). The Federal Drinking Water Health Advisory (FDWHA) for RDX is 2 ppb.

Table 1 identifies maximum levels of constituents that may be attributable to historic production activities at the EBCO site and that have been identified in the regional groundwater aquifer:

Table 1: Maximum Levels of Constituents detected in the Regional Aquifer

Constituent	*M.C.L.*	*R317-6-2*	*Proposed CACL*[1]	*Maximum Detected (2000)*[2]	*Location*	*Well Type*
Nitrate-nitrogen	*10 mg/L*	*10 mg/L*	*10 mg/L*	*21.0 mg/L*	*Young*	*Off-site private well*
Sulfate[3]	-	-	-	*180 mg/L*	*MW-5S*	*Off-site monitor well*
Lead (total)	*0.015 mg/L*	-	-	*0.0827 mg/L*[4]	*MW-17D*[4]	*On-site monitor well*
Lead (diss.)	-	*0.015 mg/L*	*0.015 mg/L*	*0.07 mg/L*[5]	*MW-11D*[5]	*On-site monitor well*
Acetone[6]	-	-	-	*29 J*[6]	*MW-16D*[6]	*On-site monitor well*
RDX	-	-	*17 ug/L*	*48.4 ug/L*	*MW-1S*	*Off-site monitor well*
HMX	-	-	*400 ug/L*	*5.27 ug/L*	*MW-6D*	*Off-site monitor well*
2,4,6-TNT[7]	-	-	*8 ug/L*	*2.16 ug/L*[7]	*FW-1*[7]	*On-site private well*
2,4-DNT[8]	-	-	*32 ug/L*	*<0.16 ug/L*	-	-
2,6-DNT[9]	-	-	*0.2 ug/L*	*0.47 ug/L*[9]	*R-1*[9]	*On-site recovery well*
NG	-	-	*52 ug/L*	*<0.10 ug/L*	-	-
EGDN	-	-	*52 ug/L*	*10.1 ug/L*	*MW-10D*	*Off-site monitor well*
DEGDN	-	-	*52 ug/L*	*4.18 ug/L*	*MW-11D*	*On-site monitor well*
TEGDN	-	-	*52 ug/L*	*2.65 ug/L*	*Frischknecht*	*Off-site private well*
TMETN	-	-	*52 ug/L*	*7.90 ug/L*	*Whiting*	*Off-site private well*
BTTN	-	-	*52 ug/L*	*3.38 ug/L*	*Orton-23*	*Off-site private well*
PETN	-	-	*52 ug/L*	*2.47 ug/L*	*UP&L*	*Off-site private well*
TSNE[9]	-	-	*52 ug/L*	*18.73 ug/L*	*Young*	*Off-site private well*

Notes: Shaded cells indicate that Maximum detected concentration exceeds proposed CACL.
"J" indicates that the reported analyte concentration is an estimated value.

[1]Proposed CACLs are presented in the Corrective Action Plan (Charter Oak, 2002) that have not been approved and are currently under review.
[2]Unless specified otherwise, the maximum concentration detected during calendar year 2000 is presented.
[3]No MCLs or ground water protection standards are established for sulfate. The secondary drinking water standard for sulfate is 250 mg/L. Sulfate is included as it may be attributable to historic manufacturing operations at the site. High sulfate concentrations are also reported in the Spanish Fork River which recharges the regional aquifer system in the study area.
[4]Based on preliminary data from on-site RFI monitoring wells. Dissolved lead was not detected in this sample.
[5]Sample collected in October 1998. Neither total nor dissolved lead were detected (MDL ' 0.005 mg/L) in subsequent sampling of R-1, MW-1S, MW-1D, MW-2S, MW-6D, MW-7D, MW-12 and B-9 (Charter Oak, 1998c).
[6]Based on preliminary data from recently installed RFI monitoring wells.
[7]Since 1995, TNT has been detected a total of four times in two different wells that are open to the regional aquifer. The highest reported concentration was reported in FW-1 in October 1998.
[8]The compound 2,4-DNT was added to the ground water monitoring parameter list in the first quarter of 2001. The compound 2,4-DNT has not been detected in the regional aquifer during two rounds of sampling.
[9]Since 1995, the compound 2,6-DNT has been detected a total of four times at four different locations. This value represents the highest concentration reported (August 2000). The compound 2,6-DNT has not been detected in the regional aquifer during two rounds of sampling in 2001.
[10]TSNE (Total Specialty Nitrate Esters) represents the combined concentrations of NG, EGDN, DEGDN, TEGDN, TMETN, BTTN and PETN.

Table 2 identifies maximum levels of constituents that may be attributable to historic production activities at the EBCO site and that have been detected in perched ground water. Perched ground water identified in the northeast corner of the EBCO site lies above, and is not part of, the regional aquifer. Based on available preliminary data, the perched ground water is of limited lateral and vertical extent and is contained within relatively low permeability deposits. This zone of perched ground water does not have any beneficial use and does not meet the definition of an "aquifer" as defined by the Utah Administrative Rules for Ground Water Quality Protection (R317-6). Section R317-6-1 of Utah Administrative Code defines an aquifer as follows:

> **"Aquifer" means a geologic formation, group of geologic formations or part of a geologic formation that contains sufficiently saturated permeable material to yield usable quantities of water to wells and springs.**

Nevertheless, information concerning the perched ground water is provided to assist the reviewer.

Preliminary water quality data from the perched ground water are available from recently completed monitoring wells that are open to perched ground water underlying the northeast corner of the EBCO site in the general area of SWMU's 1, 16, 18, 30, 31 and 42. This zone of perched ground water is approximately 80 to 100 feet below the ground surface and is approximately 100 feet above the top of the zone of saturation of the regional unconsolidated aquifer.

Table 2: Maximum Levels of Constituents detected in On-site Perched Ground Water (Preliminary Data)

Constituent	*Maximum Detected*[1]	*Location*
Nitrate-nitrogen	*1480 mg/L*	*MW-23S*
Sulfate	*1200 mg/L*	*MW-23S*
Lead (total)	*0.0487 mg/L*[2]	*MW-16S*
Lead (dissolved)	*0.0025 mg/L*	*MW-22S*
Benzene	*0.0006 mg/L*	*MW-21S*
Dibromochloro-methane (THM)	*0.0005 mg/L T*[3]	*MW-16S*
Methylene Chloride	*0.001 mg/L T*[3]	*MW-16S*
Toluene	*0.0003 mg/L T*[3]	
RDX	*728 ug/L*	*MW-16S*[4]
HMX	*73.6 ug/L*	*MW-16S*[4]
2,4,6-TNT	*<0.16 ug/L*	-
2,4-DNT	*<0.24 ug/L*	-
2,6-DNT	*1.45 ug/L*	*MW-22S*
NG	*368 ug/L*	*MW-16S*[4]
EGDN	*5230 ug/L*	*MW-19S*
DEGDN	*20500 ug/L*	*MW-22S*
TEGDN	*3760 ug/L*	*MW-22S*
TMETN	*122 ug/L*	*MW-22S*
BTTN	*15.6 ug/L*	*MW-16S*[4]
PETN	*61.7 ug/L*	*MW-16S*[4]
TSNE[5]	*28362.5 ug/L*	*MW-22S*

"T" indicates that the analyte concentration is less than the PQL but greater than the MDL and should be considered estimated.

The proposed CACLs identified in Table 1 apply to the regional aquifer only and are not intended for application to perched ground water as the perched ground water is not considered to have any beneficial use.

3. Has the **migration** of contaminated groundwater **stabilized** (such that contaminated groundwater is expected to remain within "existing area of contaminated groundwater"[2] as defined by the monitoring locations designated at the time of this determination)?

__x__ If yes - continue, after presenting or referencing the physical evidence (e.g., groundwater sampling/measurement/migration barrier data) and rationale why contaminated groundwater is expected to remain within the (horizontal or vertical) dimensions of the "existing area of groundwater contamination"[2]).

_____ If no (contaminated groundwater is observed or expected to migrate beyond the designated locations defining the "existing area of groundwater contamination"[2]) - skip to #8 and enter "NO" status code, after providing an explanation.

_____ If unknown - skip to #8 and enter "IN" status code.

[2] "existing area of contaminated groundwater" is an area (with horizontal and vertical dimensions) that has been verifiably demonstrated to contain all relevant groundwater contamination for this determination, and is defined by designated (monitoring) locations proximate to the outer perimeter of "contamination" that can and will be sampled/tested in the future to physically verify that all "contaminated" groundwater remains within this area, and that the further migration of "contaminated" groundwater is not occurring. Reasonable allowances in the proximity of the monitoring locations are permissible to incorporate formal remedy decisions (i.e., including public participation) allowing a limited area for natural attenuation.

Rationale and Reference(s):

The Corrective Action Plan (Charter Oak, 2002) provides a detailed review of hydrogeologic and ground water quality data available for the project area. These data are used to characterize the hydrogeology of the study area, the distribution of solutes and the trends in ground water chemical data. The Corrective Action Plan, currently out for public comment, also presents a review of environmental fate and transport mechanisms that may affect the behavior of the constituents of concern. The Corrective Action Plan also describes a corrective action that includes a combination of pump-and-treat remediation and natural attenuation to address constituents present in the regional aquifer. The summary information provided below to support the ground water migration stabilization assessment is presented in the Corrective Action Plan.

Based on the information contained in the Corrective Action Plan and ground water monitoring data collected over the past ten years, the migration of impacted ground water appears stabilized. No CEMs have been detected beyond the size of the established groundwater plume. The migration of contaminated groundwater is under control due to the combination of nature attenuation processes and the pump-and-treat system. The supporting information for this groundwater determination is presented in more detail in the proposed Corrective Action Plan, which includes information about the conceptual model of ground water flow, water level elevations, solute distribution, Chemicals of Concerns (COC) concentration trends, zones of capture, corrective action activities and natural attenuation.

It is should be mentioned that, because the hydrogeologic settings are extremely heterogeneous and complex in the general area of study, the area hydrogeologic conditions, such as groundwater flow directions, the properties of the area geologic faults, etc., are not still well understood after more than ten years of extensive hydrogeologic investigations and assessments. For example, because of the heterogeneous nature of the regional aquifer and the variable well completion depths, it is not appropriate to estimate the direction of ground water movement by showing flow lines perpendicular to the ground water level elevation contours. There are several aquifer systems present in the study area: the bedrock aquifer; the regional unconsolidated aquifer; the perched Mapleton Bench ground water system; and localized areas of perched ground water, above the regional unconsolidated aquifer system. The regional

hydrogeological information can be found in the Hydrology and simulation of ground water flow in the southern Utah and Goshen Valleys, Utah: United States Geological Survey in cooperation with the Utah Department of Natural Resources Division of Water Rights, Utah DNR Technical Publication No. 111 (1995) and the Corrective Action Plan (2001).

References

- Corrective Action Plan (Charter Oak Environmental Services, Inc.), 2002, The Ensign-Bickford Company, Spanish Fork, Utah.

- Hydrology and simulation of ground water flow in the southern Utah and Goshen Valleys, Utah (Brooks, L.E. and B.J. Stolp), 1995, United States Geological Survey in cooperation with the Utah Department of Natural Resources Division of Water Rights, Utah DNR Technical Publication No. 111.

- The Geology of North America (Mifflin, M.D.), 1988, Vol. O-2, Hydrogeology, Chapter 8, Region 5, Great Basin: The Geological Society of America.

- Final Revised, Volume II, Field Sampling Program, RCRA Facility Investigation at The Ensign-Bickford Company Facility in Spanish Fork, Utah (Montgomery Watson), 1998

- Quarterly Reports and Annual Reports for recovery system performance, general water quality, and potentiometric data (Charter Oak Environmental).

- Well Head Protection Plan, 1998 (Charter Oak Environmental).
R-1, R-2 and Orton-23 Well Construction and Pump Test Reports, 1998 (Charter Oak Environmental).

- Nitrate and RDX Distribution and Fate Report (Charter Oak Environmental).
- Data Collection Plan, 1998 (Charter Oak Environmental).
- An Evaluation of Wastewater Management Alternatives, 1997 (Consulting Environmental Engineerings).
- R-3 Well Construction and Pump Test, 1997 (Owens Western Company).
- Supplemental Hydrogeologic Investigation Report, 1996 (Owens Western Company).
- Phases Ia, Ib, II, III and IV Hydrogeologic Investigation Reports, 1992-1995, and Hydrogeologic Investigation Plan 1991 (Owens Western Company).
- Hydogeologic Assessment Program, 1989 and 1990 (Engineering Science).
- A Hydrogeologic Evaluation of the IMC Springville Plant Site, Utah, Phase I (1979); Preliminary Investigation of Waste Management at the IMC Springville Plant, Phase II (1980); A Hydrogeologic Evaluation of the IMC Springville Plant Site, Utah, Phase III (1981); and Hydrogeologic Evaluation of the IMC Springville Plant Site, Utah, Phase IV (1981) (PE LaMoreaux & Associates).

4. Does "contaminated" groundwater **discharge** into **surface water** bodies?

_____ If yes - continue after identifying potentially affected surface water bodies.

__x__ If no - skip to #7 (and enter a "YE" status code in #8, if #7 ' yes) after providing an explanation and/or referencing documentation supporting that groundwater "contamination" does not enter surface water bodies.

_____ If unknown - skip to #8 and enter "IN" status code.

Rationale and Reference(s):

Based upon the current understanding of the hydrogeologic system, impacted ground water present in on-site perched zones and the regional aquifer does not discharge to surface water bodies (Corrective Action Plan, Charter Oak, 2002).

The Spanish Fork River, which is located less than one half mile southwest of the EBCO site, is a losing stream in the area near the mouth of Spanish Fork Canyon and water from the Spanish Fork River recharges the regional aquifer system in this area. Therefore, ground water from the regional aquifer system cannot discharge to the Spanish Fork River. Based on preliminary RFI data, impacted perched ground water that is present in the northeast corner of the EBCO site flows in a northerly direction and would not discharge to the Spanish Fork River.

Hobble Creek is located approximately four miles north of the EBCO site. The stream channel of Hobble Creek is over 100 feet higher than the water table of the regional aquifer. Water quality data from wells located adjacent to Hobble Creek (Seal and Carneseca) indicate that CEMs are not present at these locations and nitrates are present at levels substantially below the ground water quality protection standard of 10 mg/L.

The Mapleton Lateral is an engineered irrigation feature that flows from south to north from the Spanish Fork River toward Hobble Creek. The Mapleton Lateral crosses the EBCO site from south to north and is concrete lined over a portion of the distance. The base of the Mapleton Lateral is approximately 85 feet higher than the top of the water table of the regional unconsolidated aquifer. Perched ground water on the site is found in the northeast portion of the property and preliminary water level elevation data suggest a northerly perched ground water flow direction (to the extent that there is any significant flow at all). All of the available data indicate that perched ground water does not discharge to the Mapleton Lateral.

The regional aquifer ultimately discharges to Utah Lake; however, Utah Lake is located approximately five miles beyond the known extent of ground water impacts.

The references are the same as the previously listed.

5. Is the **discharge** of "contaminated" groundwater into surface water likely to be "**insignificant**" (i.e., the maximum concentration[3] of each contaminant discharging into surface water is less than 10 times their appropriate groundwater "level," and there are no other conditions (e.g., the nature, and number, of discharging contaminants, or environmental setting), which significantly increase the potential for unacceptable impacts to surface water, sediments, or eco-systems at these concentrations)?

_____ If yes - skip to #7 (and enter "YE" status code in #8 if #7 ' yes), after documenting: 1) the maximum known or reasonably suspected concentration[3] of key contaminants discharged above their groundwater "level," the value of the appropriate "level(s)," and if there is evidence that the concentrations are increasing; and 2) provide a statement of professional judgement/explanation (or reference documentation) supporting that the discharge of groundwater contaminants into the surface water is not anticipated to have unacceptable impacts to the receiving surface water, sediments, or eco-system.

_____ If no - (the discharge of "contaminated" groundwater into surface water is potentially significant) - continue after documenting: 1) the maximum known or reasonably suspected concentration[3] of each contaminant discharged above its groundwater "level," the value of the appropriate "level(s)," and if there is evidence that the concentrations are increasing; and 2) for any contaminants discharging into surface water in concentrations[3] greater than 100 times their appropriate groundwater "levels," the estimated total amount (mass in kg/yr) of each of these contaminants that are being discharged (loaded) into the surface water body (at the time of the determination), and identify if there is evidence that the amount of discharging contaminants is increasing.

_____ If unknown - enter "IN" status code in #8.

Rationale and Reference(s):_____

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[3] As measured in groundwater prior to entry to the groundwater-surface water/sediment interaction (e.g., hyporheic) zone.

6. Can the **discharge** of "contaminated" groundwater into surface water be shown to be "**currently acceptable**" (i.e., not cause impacts to surface water, sediments or eco-systems that should not be allowed to continue until a final remedy decision can be made and implemented[4])?

____ If yes - continue after either: 1) identifying the Final Remedy decision incorporating these conditions, or other site-specific criteria (developed for the protection of the site's surface water, sediments, and eco-systems), and referencing supporting documentation demonstrating that these criteria are not exceeded by the discharging groundwater; OR
2) providing or referencing an interim-assessment,[5] appropriate to the potential for impact, that shows the discharge of groundwater contaminants into the surface water is (in the opinion of a trained specialists, including ecologist) adequately protective of receiving surface water, sediments, and eco-systems, until such time when a full assessment and final remedy decision can be made. Factors which should be considered in the interim-assessment (where appropriate to help identify the impact associated with discharging groundwater) include: surface water body size, flow, use/classification/habitats and contaminant loading limits, other sources of surface water/sediment contamination, surface water and sediment sample results and comparisons to available and appropriate surface water and sediment "levels," as well as any other factors, such as effects on ecological receptors (e.g., via bio-assays/benthic surveys or site-specific ecological Risk Assessments), that the overseeing regulatory agency would deem appropriate for making the EI determination.

_____ If no - (the discharge of "contaminated" groundwater can not be shown to be "**currently acceptable**" - skip to #8 and enter "NO" status code, after documenting the currently unacceptable impacts to the surface water body, sediments, and/or eco-systems.

_____ If unknown - skip to 8 and enter "IN" status code.

Rationale and Reference(s):_____
_____
_____
_____
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_____
_____
_____

[4] Note, because areas of inflowing groundwater can be critical habitats (e.g., nurseries or thermal refugia) for many species, appropriate specialist (e.g., ecologist) should be included in management decisions that could eliminate these areas by significantly altering or reversing groundwater flow pathways near surface water bodies.

[5] The understanding of the impacts of contaminated groundwater discharges into surface water bodies is a rapidly developing field and reviewers are encouraged to look to the latest guidance for the appropriate methods and scale of demonstration to be reasonably certain that discharges are not causing currently unacceptable impacts to the surface waters, sediments or eco-systems.

7. Will groundwater **monitoring** / measurement data (and surface water/sediment/ecological data, as necessary) be collected in the future to verify that contaminated groundwater has remained within the horizontal (or vertical, as necessary) dimensions of the "existing area of contaminated groundwater?"

__X__ If yes - continue after providing or citing documentation for planned activities or future sampling/measurement events. Specifically identify the well/measurement locations which will be tested in the future to verify the expectation (identified in #3) that groundwater contamination will not be migrating horizontally (or vertically, as necessary) beyond the "existing area of groundwater contamination."

_____ If no - enter "NO" status code in #8.

_____ If unknown - enter "IN" status code in #8.

Rationale and Reference(s):

The Corrective Action Plan (Charter Oak, 2002) presents a proposed monitoring plan for continued assessment of ground water quality and water level conditions in the regional aquifer. According to the proposed monitoring plan, water levels will be measured monthly from all monitoring wells and some private wells and also be measured weekly from all the extraction wells. A primarily quarterly monitoring program will be implemented for CEMs and nitrate-nitrogen analyses in the study area to confirm the determination that the migration of contaminated groundwater is under control. Chemical analyses will be conducted monthly for the extraction wells.

Three new monitoring wells that were proposed in the Corrective Action Plan (Charter Oak, 2002) have been installed. These monitoring wells are located to assess ground water quality conditions in the deeper intervals of the regional aquifer along the western margins of the affected area, and also aid in the assessment of ongoing ground water remediation activities which consist of a combination of active restoration (pump and treat) and natural attenuation.

Migration of Contaminated Groundwater Under Control
Environmental Indicator (EI) RCRIS code (CA750)

8. Check the appropriate RCRIS status codes for the Migration of Contaminated Groundwater Under Control EI (event code CA750), and obtain Supervisor (or appropriate Manager) signature and date on the EI determination below (attach appropriate supporting documentation as well as a map of the facility).

_YE__ YE - Yes, "Migration of Contaminated Groundwater Under Control" has been verified. Based on a review of the information contained in this EI determination, it has been determined that the "Migration of Contaminated Groundwater" is "Under Control" at **The Ensign-Bickford Company** facility , EPA ID **# UTD041310962**, located at **8305 South Highway 6, Spanish Fork, Utah**. Specifically, this determination indicates that the migration of "contaminated" groundwater is under control, and that monitoring will be conducted to confirm that contaminated groundwater remains within the "existing area of contaminated groundwater." This determination will be re-evaluated when the Agency becomes aware of significant changes at the facility.

_____ NO - Unacceptable migration of contaminated groundwater is observed or expected.

_____ IN - More information is needed to make a determination.

Completed by (signature) _____ Date 9/17/04
(print) Hao Zhu
(title) Environmental Engineer

Supervisor (signature) Brad Maulding Date 9/17/04
(print) Brad Maulding
(title) Section Manager
(EPA Region or State) Utah DEQ

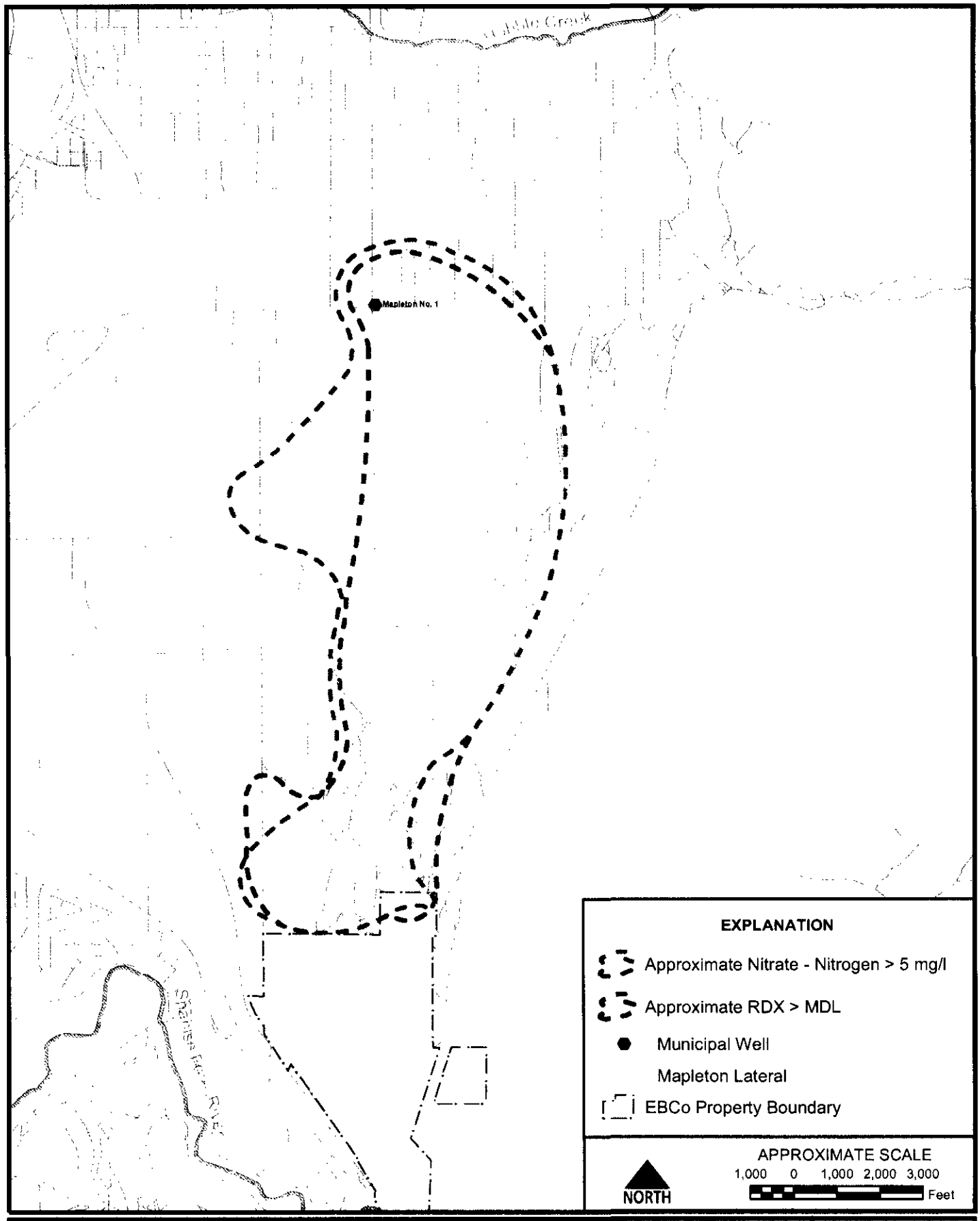
Locations where References may be found:

Off-site groundwater:
Utah Division of Water Quality
Cannon Health Building, 3rd Floor
288 North 1460 West
Salt Lake City, UT 84114-4870

On-site RFI activities:
Utah Division of Solid and Hazardous Waste
Cannon Health Building, 4th Floor
288 North 1460 West
Salt Lake Cit, UT 84114-4880

Contact telephone and e-mail numbers

(name) Hao Zhu (at the DSHW office)
(phone #) 1-801-538-6170



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NITRATE - NITROGEN AND RDX
APPROXIMATE DISTRIBUTION MAP
2003