Alan C. Lloyd, Ph.D.
Agency Secretary
Cal/EPA

# Department of Toxic Substances Control

Maureen F. Gorsen, Director
8800 Cal Center Drive
Sacramento, California 95826-3200

Arnold Schwarzenegger
Governor

April 3, 2006

Mr. Michael Bloom
BRAC Environmental Coordinator
Department of the Navy
Base Realignment and Closure
Program Management Office West
1455 Frazee Road, Suite 900
San Diego, California 92108-4310

DETERMINATION OF NO FURTHER ACTION FOR THE BALLFIELDS PARCELS (PARCELS 108A, 110, 112, 114, 115A and 117) AT FORMER DEPARTMENT OF DEFENSE HOUSING FACILITY, FORMER HAMILTON ARMY AIRFIELD

Dear Mr. Bloom:

The Department of Toxic Substances Control (DTSC),and the San Francisco Bay Regional Water Quality Control Board (RWQCB) (collectively, the State), have completed review of the Navy's Draft Final Preliminary Assessment/Site Inspection Report, dated February 24, 2006, for the Ballfields parcels located at former Hamilton Army Airfield (see attached map).

The State has determined that No Further Action is necessary for the Ballfields parcels with regard to human health and the environment (see attachment), pursuant to Health and Safety Code Chapters 6.8 and 6.5, and that the parcels are suitable for unrestricted land use. This determination is based on the following:

1. RWQCB's determination that the shallow groundwater is not suitable for drinking water as evaluated using the State Water Board's Resolution 88-63, and there is no potential for other beneficial uses of groundwater (e.g. agricultural supply waters), because of high total dissolved solids. (See RWQCB letter dated March 3, 2006),

2. DTSC's determination of no significant risks for the construction worker due to dermal contact with arsenic and vanadium in groundwater (see DTSC memorandum dated March 20, 2006), and

3. DTSC's determination that site concentrations of lead and DDT are above concentrations associated with no-effects to ecological receptors, but that remaining risks to ecological receptors were acceptable.

This approval is based on existing information available to the State at this time. Should new information concerning the environmental condition of the property become available in the future, the State reserves the right to address any significant environmental or human health issues.

Please be advised that should this property be considered for the proposed acquisition and/or construction of school properties utilizing state funding, a separate environmental review process in compliance with the California Education Code 17210 et Seq. will need to be conducted and approved by DTSC.

If you have any questions, please contact Ms. Theresa McGarry of my staff at (916) 255-3664.

Sincerely,

Anthony J. Landis
Chief
Northern California Operations
Office of Military Facilities

Attachments

cc: See next page.

cc:

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# California Regional Water Quality Control Board
## San Francisco Bay Region

**Dr. Alan Lloyd**
*Secretary for Environmental Protection*

1515 Clay Street, Suite 1400, Oakland, California 94612
(510) 622-2300 • Fax (510) 622-2460
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**Arnold Schwarzenegger**
*Governor*

Date: MAR 0 3 2006
2159.5008 (NLF)

Ms. Theresa McGarry
Office of Military Facilities
Department of Toxic Substances Control
8800 Cal Center Drive
Sacramento, California 95826

**Subject: Determination if Groundwater at the Navy Ballfields Site is Suitable for a Domestic/Municipal Supply Beneficial Use Designation, DOD Housing Facility, Hamilton Field, Novato, Marin County**

Dear Ms. McGarry,

The Department of Toxic Substances Control has requested that we evaluate whether shallow groundwater at the Navy Ballfields site meets the drinking water exclusions identified in the State Water Board's Resolution 88-63. Resolution 88-63 states that groundwaters of the State are considered to be suitable, or potentially suitable, for municipal or domestic water supply with the exception of groundwater where the total dissolved solids (TDS) exceed 3,000 mg/L and it is not reasonably expected by Regional Boards to supply a public water system, or the water source does not provide sufficient water to supply a single well capable of producing an average, sustained yield of 200 gallons per day.

The San Francisco Bay Region Basin Plan (Basin Plan) designates the beneficial uses of groundwater in the Novato Valley as potentially municipal and domestic supply, industrial process and service water supply, and agricultural water supply. The 18-acre Navy Ballfields site has the same hydrogeological setting as the adjacent 600-acre former Hamilton Main Airfield site, where TDS concentrations in groundwater ranges from 819 to 18, 270 mg/L with an average TDS concentration of 4,898 mg/L (Final Main Airfield Parcel, ROD/RAP 2003). Given the high TDS of the groundwater in this area, it is not reasonable to assume that groundwater will be used to supply a public water system. Therefore, Water Board staff concurs with the Navy's conclusion (Draft Final PA/SI, February 2006) that groundwater is not suitable for municipal uses.

DTSC is also concerned about protecting other potential beneficial uses, i.e., the industrial process and service water supply and agricultural water supply as mentioned above. The Basin Plan states that most industrial service supplies do not have water quality limitations. There are no meaningful criteria for industrial process supply as various water treatment technologies exist that can create desired product water quality that would be tailored for specific uses. As to agricultural uses, groundwater with a high TDS is not suitable as agricultural supply water. Therefore, as in the case for a public water supply system, Water Board staff concludes that the

high TDS and potentially low yield for groundwater in this area makes it unsuitable for these potential uses. Therefore, no additional action as pertains to groundwater at the site is required.

Given the above Water Board staff concurs with February, 2006 PA/SI conclusion that no further action for groundwater is required for this site.

If you have any questions, please contact me at (510) 622-2328 or by email nfeger@waterboards.ca.gov.

Sincerely,

Naomi L. Feger

Naomi L. Feger
Remedial Project Manager

cc: Mr. Michael S. Bloom, Department of the Navy
Mr. Tom Gandesbery, State Coastal Conservancy

Alan C. Lloyd, Ph.D.
Agency Secretary
Cal/EPA

# Department of Toxic Substances Control

Maureen F. Gorsen, Director
8800 Cal Center Drive
Sacramento, California 95826-3200

Arnold Schwarzenegger
Governor

## MEMORANDUM

**TO:** Theresa McGarry
Department of Toxic Substances Control
Office of Military Facilities
Northern California Operations Branch
8800 Cal Center Drive
Sacramento, California 95826

**From:** Patty Wong-Yim, Ph.D.
Staff Toxicologist
Human and Ecological Risk Division (HERD)

**DATE:** March 20, 2006

**SUBJECT:** Construction Worker Risk Evaluation for Ballfields Parcels at Department of Defense Housing Facility, Novato, California.

PCA: 18040 Site Code: 200529-18

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## BACKGROUND

**Document Reviewed:** In response to your request (email dated February 27, 2006), HERD has performed a construction worker risk evaluation for Ballfields parcels at Department of Defense Housing Facility (DoDHF), Novato, California.

**Location and Setting:** In 1932, the US Army Air Corps (USAAC) constructed Hamilton Army Airfield (HAAF) on reclaimed tidal wetland. In 1947, the USAAC transferred HAAF to the Air Force and renamed it as Hamilton Air Force Base. In 1975, the US Navy received a residential portion of the Base. The Navy used the Ballfields parcels as a baseball field and open space until 1994, when the Department of Defense (DoD) scheduled DoDHF Novato for closure under the Base Realignment and Closure Program.

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The Ballfields parcels comprise approximately 18 acres of land. North of the site are a levee and privately owned residences. The California State Coastal Conservancy (SCC) owns the south and east neighboring parcels. Initial research on historical records of the Ballfields parcels (108A, 110, 112, 114, 115A, and 117) identified four areas of potential concern (AOPCs), which include:

- five former airplane revetments,
- two spoils piles originating from the Perimeter Drainage Ditch (PDD),
- two former ordnance magazine Buildings 191 and 193 (also a former transformer vault and switch station), and
- area-wide dichlorodiphenyltrichloroethane contamination.

Depth to groundwater ranges from 3 to 8 ft below ground surface (bgs), with an average of 5.5 ft bgs.

**Previous Activity**: In a memorandum dated January 31, 2006, HERD replied to Navy's response to comments on the Draft Preliminary Assessment/Site Investigation (PA/SI) Report for the Ballfields parcels. On October 14, 2005, HERD provided comments on the Draft PA/SI document. On October 14, 2005, HERD participated in a teleconference with DTSC project manager and San Francisco Regional Water Quality Control Board (RWQCB) project manager to discuss groundwater risk of the property.

## RISK EVALUATION

1. **Objectives**: The Draft PA/SI document reveals an excessive cancer risk for residential exposure to groundwater via the hypothetical drinking water pathway (1.3E-2). The construction worker receptor was not included in the human health risk assessment (HHRA). Although RWQCB has found no beneficial use of the groundwater onsite due to low yield and high total dissolved solid (TDS) (email from Naomi Feger to Theresa McGarry, dated November 22, 2005) and SCC clearly indicates the limited future land use of the property as wetlands (an agreement between the Navy and SCC, 2006), HERD considers direct dermal contact with groundwater during construction activities to be a complete exposure pathway because of shallow groundwater onsite (Table 1). In order to fill this HHRA data gap, HERD has included a construction worker risk evaluation in this memorandum.

2. **Risk Assessment Assumptions:**

a. Soil Risk Evaluation: A preliminary risk assessment for construction workers was performed by adopting the USEPA Region IX Preliminary Remediation Goals (PRGs) methodology (USEPA, 2004a). Considering the USEPA Region IX does not provide construction worker PRGs, HERD estimates the construction worker soil risk from the residential soil risk based on the following assumptions:

- Risk from construction worker exposure to soil chemicals of potential concern (COPCs) was estimated by modifying the residential soil risk based on differences in daily soil ingestion rate, exposure duration, exposure frequency, and body weight between the two human receptors.
- In order to provide a conservative risk assessment, maximum concentration of COPCs in soil was used in the risk calculation.

For reference, the default exposure parameters and risk equation used in the calculation are summarized in Attachment 2.

b. Groundwater Risk Evaluation: In the Draft PA/SI document, the Navy adopted the USEPA Region IX Tap Water PRGs (USEPA, 2004a) in the residential groundwater risk calculation. Since the Tap Water PRGs are specifically designed for exposure via drinking water and domestic use of groundwater, they are not applicable for construction worker exposure. Since shallow groundwater (3 to 8 feet below ground surface) is present onsite, HERD considers the direct dermal contact with groundwater as a complete exposure pathway under the construction worker scenario (Table 1). HERD followed the USEPA risk assessment guidance (USEPA, 2004b) to derive the groundwater risk based on the following assumptions:

- Since low levels of volatile organic chemicals (VOCs) were detected in groundwater, inhalation risk from VOCs in ambient air was not evaluated.
- The Draft PA/SI reveals that arsenic (risk of 1.3E-2) is the predominant risk driver, while arsenic (hazard quotient of 8.1) and vanadium (hazard quotient of 11) are the major non-cancer hazard drivers. In order to simplify the dermal risk calculation, only risks from direct dermal contact with arsenic and vanadium in groundwater are evaluated under the construction worker scenario.
- In order to provide a conservative risk assessment, the maximum concentrations of COPCs were used in the risk calculation.

For reference, the default exposure parameters, chemical-specific parameters, and risk equation used in the calculation are summarized in Attachment 3.

3. **Risk Assessment Results**:

a. Residential Receptor: The Draft PA/SI reports a site-wide cumulative residential risk of 1.3E-2, with a soil risk of 1.6E-6 and a groundwater risk of 1.3E-2. The site-wide residential non-cancer hazard index (HI) is 14, with a soil hazard quotient (HQ) of 2.3E-1 and groundwater HQ of 14. RWQCB has determined no beneficial use of the groundwater underneath the Ballfields parcels. As a result, HERD considers the drinking water pathway incomplete. According to the PA/SI, low levels of VOCs were

detected in groundwater such that risk from groundwater exposure via the inhalation of VOCs in ambient air is negligible. Based on this information, we concur with the Draft PA/SI that the potential cumulative risk is 1.6E-6 and the HI is 2.3E-1 for residents.

b. Recreational Receptor: Based on the hypothetical residential risk of 1.6E-6, low exposure frequency and low exposure duration for the recreational receptor, HERD strongly believes that the cumulative risk for the recreational receptor is below the point of departure for risk assessment (1E-6). Since the residential HI is 2.3E-1, the recreational receptor HI is also expected to be less than one.

c. Construction Worker: As stated above, dermal contact with groundwater during construction activities (trenching and digging) is the only complete groundwater exposure pathway for construction workers (Table 1 of Attachment 1). The construction worker risk assessment results are summarized in Table 4 of Attachment 4. We conclude that the site-wide construction worker cumulative risk is 2.9E-7, which is mainly contributed by direct dermal contact with arsenic in groundwater. The site-wide construction worker HI is 7.2E-2, which is mainly contributed by exposure to various metals in soil.

## DISCUSSION and CONCLUSION

Although the arsenic and vanadium in groundwater may pose excess risk and hazard under the residential scenario, RWQCB has determined no beneficial use of the groundwater onsite, based on low yield and high TDS. Under the property transfer agreement between the Navy and SCC, future land use on the property will be limited to wetlands. Therefore, HERD concludes that residential exposure to groundwater via the drinking water pathway is incomplete. Despite a residential soil risk slightly above the point of departure for risk assessment, residential use of the property (both current and future) is highly unlikely. We consider the construction worker and recreational receptors as the most probable human receptors for the site (both current and future). Because the site-wide cumulative risks for recreational and construction worker receptors are below the point of departure for cancer and the HIs are below one, HERD concurs with the Navy's recommendation of no further action for the Ballfields parcels, with respect to human health. Our review and comments do not address potential harm to ecological receptors.

If you have any questions or concerns, please contact me at (916) 255-6438.

Reviewed by Brian Davis, Ph.D. Brian K. Davis
Staff Toxicologist
Human and Ecological Risk Division

## REFERENCES

SCC, California State Coastal Conservancy. (2006) Groundwater Usage at Hamilton Navy Ballfields. Memorandum from Tom Gandesbery to Michael Bloom.

USEPA, Region IX Office. (2004a) Users' Guide and Background Technical Document for USEPA Region IX's Preliminary Remediation Goals (PRG) Table and PRG Table. (http://www.epa.gov/region09/waste/sfund/prg/files/04usersguide.pdf)

USEPA, Office of Superfund Remediation and Technology Innovation U.S., Washington, DC, EPA/540/R/99/005, OSWER 9285.7-02EP, PB99-963312. (2004b) Risk Assessment Guidance for Superfund Volume I: Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment) Final (http://www.epa.gov/oswer/riskassessment/ragse/pdf/2004_1101_part_e.pdf)

## Attachment 1: Conceptual Site Model for the Ballfields Parcels

Table 1. Conceptual Site Model

| Residential Exposure Pathways | Residential | Recreational | Construction worker |
|---|---|---|---|
| Groundwater | – no complete pathway | – inhalation of ambient air VOCs[a] | – direct dermal contact<br>– inhalation of VOCs[b] |
| Soil | – ingestion<br>– direct dermal contact<br>– inhalation of particulates and VOCs | – ingestion<br>– direct dermal contact<br>– inhalation of particulates and VOCs | – ingestion<br>– direct dermal contact<br>– inhalation of particulates and VOCs |

[a]Low levels of VOCs were detected in groundwater. Inhalation exposure to VOCs released from groundwater to ambient air is negligible for recreational receptors.

[b]Low levels of VOCs were detected in groundwater. Only dermal exposure was evaluated for construction workers.

**Attachment 2: Risk and Hazard for Construction Worker Exposure to Chemicals of Potential Concern in Soil**

Table 2a. Default Construction Worker Exposure Parameters for Soil Risk Evaluation

| Default Parameter | Residential | Construction Worker |
|---|---|---|
| Adjusted soil ingestion, ([mg-yr]/[kg-d])[a] | 114 | 4.7 |
| Soil ingestion rate, mg/day | Child: 200<br>Adult: 100 | 330 |
| exposure frequency, day/yr | 350 | 250 |
| exposure duration, year | Child: 6<br>Adult: 24 | 1 |
| Body weight, kg | Child: 15<br>Adult: 70 | 70 |

[a]Adjusted ingestion factor for soil ($IFS_{adj}$) is derived according to the USEPA Region IX PRG User Guide (USEPA, 2004a).

Values of $IFS_{adj}$ are derived with the following equations:

For Residential Receptor,

$$IFS_{adj} = \frac{ED_c \times IRS_c}{BW_c} + \frac{ED_a \times IRS_a}{BW_a}$$

$$= 114[(mg - yr)/(kg - d)]$$

For Construction Workers:

$$IFS_{adj} = \frac{ED \times IRS}{BW}$$

$$= \frac{1yr \times 330mg/day}{70kg} = 4.7[(mg - yr)/(kg - d)]$$

where, $IFS_{adj}$ = adjusted ingestion factors for soil, [mg-yr]/[kg-d]
$ED_c$ = child exposure duration, yr
$ED_a$ = adult exposure duration, yr
$IRS_c$ = child soil ingestion rate, mg/day
$IRS_a$ = adult soil ingestion rate, mg/day
$BW_c$ = child body weight, kg
$BW_a$ = adult body weight, kg

For simplicity, construction worker soil risk is estimated from the residential soil risk with the following equation;

$$\text{Construction Worker Soil Risk} = \text{Residential Soil Risk} \times \frac{4.7[(mg-yr)/(kg-d)]}{114[(mg-yr)/(kg-d)]} \times \frac{250 day/yr}{350 day/yr}$$

Since the residential soil HQ was derived under the childhood exposure scenario, we estimated the construction worker HQ as follows;

$$\text{Construction Worker Soil HQ} = \text{Residential Child Soil HQ} \times \frac{330\text{mg/day}}{200 mg/day} \times \frac{250 day/yr}{350 day/yr} \times \frac{15 kg}{70 kg}$$

Table 2b. Construction Worker Soil Risk Summary

| Human Receptor | Cancer Risk | Non-Cancer Hazard |
|---|---|---|
| Residential Receptor | 1.6E-6 | 2.3E-1 |
| Construction Worker | 4.7E-8 | 5.8E-2 |

**Attachment 3: Risk and Hazard for Construction Worker Exposure to Chemicals of Potential Concern in Groundwater**

According to the Draft PA/SI, arsenic is the major risk driver in groundwater. Arsenic and vanadium are the major hazard drivers in groundwater. For simplicity, HERD derived the construction worker groundwater risk by limiting the groundwater risk evaluation to direct dermal contact with arsenic and vanadium.

Risk and hazard from direct dermal contact with groundwater under the construction worker exposure scenario are derived according to the USEPA dermal risk assessment guidance (USEPA, 2004b). Details of the risk calculation are described in below.

Absorption per daily event ($DA_{event}$) is calculated as follows;

$$DA_{event} = C_w \times t_{event} \times K_p \times CF$$

where, $DA_{event}$ = absorption per daily event, mg/cm$^2$-event
$C_w$ = chemical-specific concentration in groundwater, mg/l
$t_{event}$ = event duration, hr
$K_p$ = chemical-specific dermal permeability factor, cm/hr
CF = conversion factor, 1E-3 l/cm$^3$

Total daily absorbed doses of carcinogens and non-carcinogens are derived as follows:

$$DOSE_c = \frac{DA \times SA \times EV \times EF \times ED}{BW \times AT_c}$$

and

$$DOSE_{nc} = \frac{DA \times SA \times EV \times EF \times ED}{BW \times AT_{nc}}$$

where, $DOSE_c$ = total daily absorbed dose of carcinogens, mg/kg-day
$DOSE_{nc}$ = total daily absorbed dose of non-carcinogens, mg/kg-day
SA = area of skin in direct contact with groundwater, cm$^2$
EV = event frequency, event/day
EF = exposure frequency, day/yr
ED = exposure duration, yr
BW = body weight, kg
$AT_c$ = carcinogenic averaging time, day
$AT_{nc}$ = non-carcinogenic averaging time, day

Dermal cancer risk and hazard are derived using the California toxicity criteria with the following equations:

$$\text{Dermal Cancer Risk} = DOSE_c \times CSF$$

and

$$\text{Dermal HQ} = \frac{DOSE_{nc}}{RfD}$$

where, CSF = chemical-specific cancer slope factor, $(mg/kg\text{-}day)^{-1}$
RfD = chemical-specific reference dose, mg/kg-day

Table 3a. Construction Worker Exposure Parameters for Dermal Risk and Hazard Evaluations.

| **Exposure Parameters** | **Default Value** |
|---|---|
| Event duration, $t_{event}$ | 1 hr/event |
| Event Frequency, EV | 1 event/day |
| Exposure Frequency, EF | 90 day/yr |
| Exposure Duration, ED | 1 yr |
| Body Weight, BW | 70 kg |
| Carcinogenic Averaging Time, $AT_c$ | 25550 day |
| Non-Carcinogenic Averaging Time, $AT_{nc}$ | 365 day |
| Skin Surface Area, SA | 5700 $cm^2$ |

Table 3b: Chemical-Specific Parameters Used in Dermal Risk and Hazard Calculations.

| **COPC** | **$C_w$, mg/l** | **$K_p$, cm/hr** | **CSF, $(mg/kg\text{-}day)^{-1}$** | **RfD, mg/kg-day** |
|---|---|---|---|---|
| Arsenic | 8.87E-2 | 1E-3 | 9.45 | 3.00E-04 |
| Vanadium | 3.93E-1 | 1E-3 | n/a | 1.00E-03 |

Table 3c. Construction Worker Groundwater Risk Summary[a]

| **COPC** | **Maximum groundwater, mg/l** | **Cancer Risk** | **Hazard Quotient** |
|---|---|---|---|
| Arsenic | 8.87E-2 | 2.4E-7 | 5.9E-3 |
| Vanadium | 3.93E-1 | n/a | 7.9E-3 |
| | **Pathway Total** | 2.4E-7 | 1.4E-2 |

[a]Direct dermal contact with groundwater is the only complete pathway for groundwater exposure under the construction worker scenario. Inhalation of VOCs released from groundwater to ambient air is considered negligible due to the low levels of VOCs detected .

## Attachment 4: Human Health Risk Summary

Table 4: Human Health Risk Summary

| Human Receptor | Cancer Risk | | | Non-Cancer Hazard | | |
|---|---|---|---|---|---|---|
| | Soil | Groundwater | Cumulative Risk | Soil | Groundwater | HI |
| Resident | 1.6E-6 | 1.3E-2 | 1.3E-2 | 2.3E-1 | 1.4E+1 | 1.4E+1 |
| Construction Worker[a] | 4.7E-8 | 2.4E-7 | 2.9E-7 | 5.8E-2 | 1.4E-2 | 7.2E-2 |

[a]Only risk from exposure to arsenic and vanadium (the two risk drivers) were included in the groundwater risk evaluation.

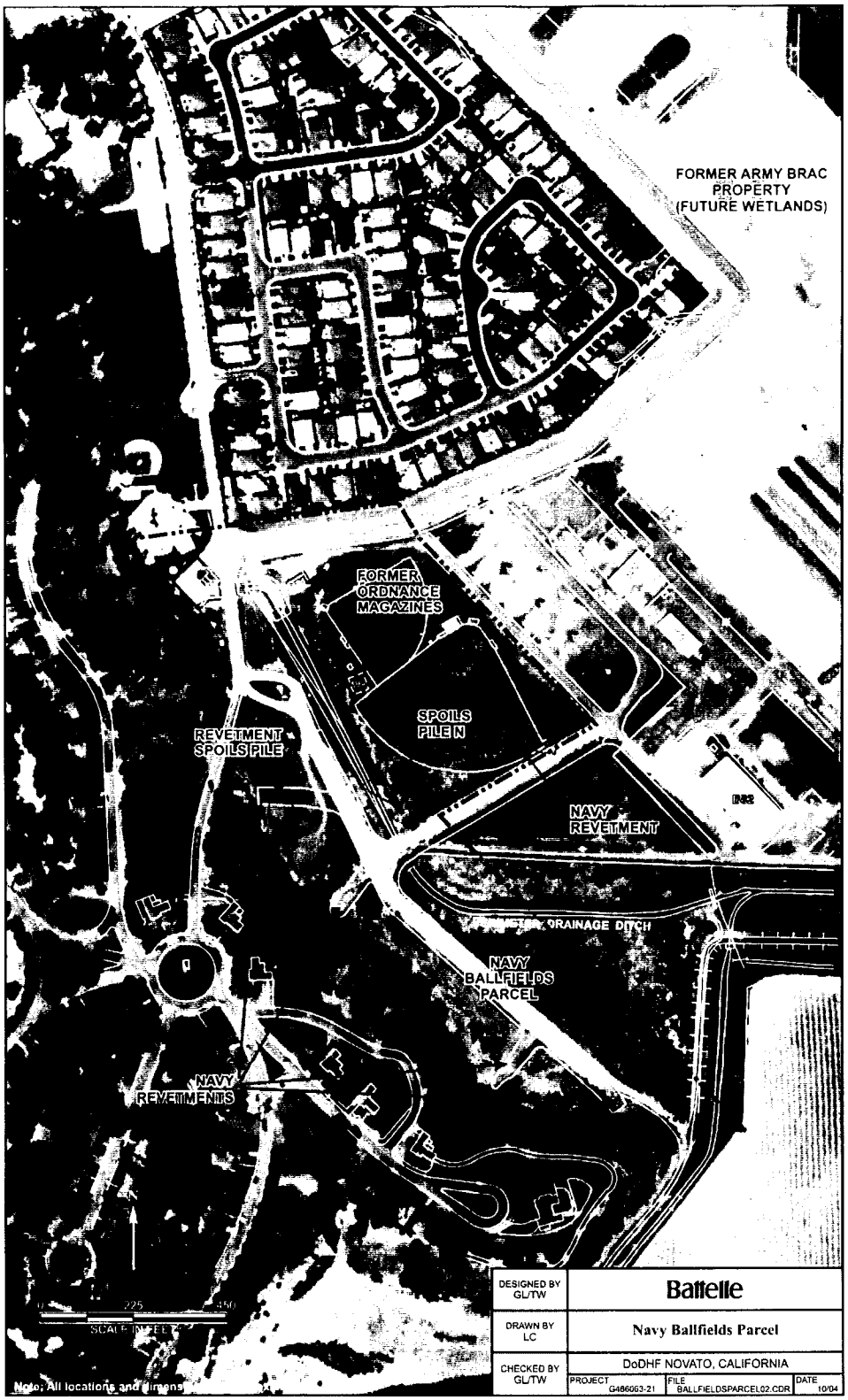


**Figure 2-1. Navy Ballfields Parcels**