

Natural Resource Damage Assessment Plan for the Burlington Northern (BN) Livingston Shop Complex

March 11, 2024, Final

BNSF Railway Company

In cooperation with
the Montana Natural Resource Damage Program (NRDP),
acting on behalf of the Governor as the trustee for the State of Montana (State)

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1. INTRODUCTION

The federal Comprehensive Environmental Response, Compensation, and Liability Act of 1980 (CERCLA), 42 U.S.C. §§ 9601 *et seq.*, as amended, and Montana's Comprehensive Environmental Cleanup and Responsibility Act (CECRA), MCA §§75-10-701, *et seq.*, as amended, authorize natural resource trustees to recover, on behalf of the public, damages for injuries to natural resources belonging to, managed by, held in trust by, appertaining to, or otherwise controlled by them. The purpose of these regulations is to provide standardized and cost-effective procedures for assessing natural resource damages [43 CFR § 11.11]. This Assessment Plan is designed in accordance with the regulations promulgated by the United States Department of the Interior (DOI) at 43 CFR Part 11. The Trustee for groundwater in this case is the Governor of the State of Montana (State), represented by the Montana Natural Resource Damage Program (NRDP).

1.1 Justification to Conduct a Natural Resource Damage Assessment

A preassessment screen (PAS), completed during the preassessment phase in accordance with federal regulations at 43 CFR § 11.23-11.25, concluded that a NRDA shall be conducted to determine the amount of restoration necessary to compensate the public for natural resources injuries resulting from hazardous substance releases from the BN Livingston Shop Complex. The PAS included a review of readily available data and documents to ensure that the Trustee has a reasonable probability of making a successful claim for natural resource damages. Specifically, the PAS concluded:

- Releases of petroleum products and other hazardous or deleterious substances have occurred;
- Groundwater, a natural resource for which the State asserts trusteeship under CERCLA and/or CECRA, has been adversely affected by the release of petroleum products and other hazardous or deleterious substances;
- The quantity and concentration of the released petroleum products and other hazardous or deleterious substances are sufficient to potentially cause injury to natural resources resulting in a diminution of services from groundwater;
- Data sufficient to pursue an assessment are readily available or likely to be obtained at a reasonable cost; and
- Remedial actions carried out or planned have not or will not fully restore, rehabilitate, or replace the lost or diminished groundwater services without further action.

Therefore, the Trustee determined that further investigation and assessment is warranted at the BN Livingston Shop Complex (the Site) in accordance with federal regulations at 43 CFR Part 11, Subparts C and E. For purposes of this NRDA, the "Site" refers to the area that contains the injured groundwater or areas where groundwater services have been impacted because of concerns over releases of hazardous substances to groundwater.

BNSF Railway Company has agreed to pay for a natural resource damage assessment (NRDA) associated with the Burlington Northern (BN) Livingston Shop Complex in compliance with section 11.F. of the Partial Modified Consent Decree, Order and Judgment (the “Consent Decree”) entered in the United States District Court for the District of Montana in the State of Montana ex rel. Department of Health and Environmental Sciences v. Burlington Northern, 88-141-H-CCL, April 27, 1990 (MPCD 1990). The NRDA will be conducted cooperatively with NRDP and each step of the assessment process, described in this Assessment Plan, will be conducted in collaboration with NRDP. This may involve NRDP commenting on products or analyses completed by BNSF or BNSF and NRDP completing products or analyses cooperatively. Decisions will be made by NRDP, collaboratively with BNSF, as appropriate.

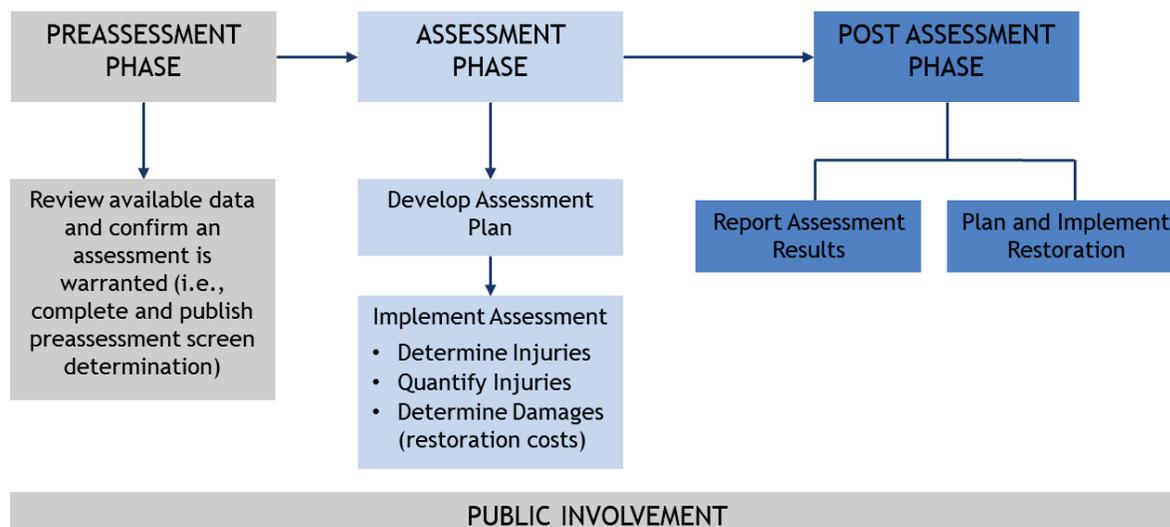
1.2 Purpose of the Assessment Plan

The purpose of this Assessment Plan is to describe a planned and systematic approach for determining and quantifying injuries to the groundwater resource and damages associated with those injuries. Injury is defined as a measurable adverse change in the chemical or physical quality of a natural resource resulting from exposure to release of oil¹ or hazardous substance [43 CFR § 11.14(v)]. Damages are the amount of money sought by the Trustee as compensation for the loss of natural resource services resulting from the release of oil or hazardous substances [43 CFR § 11.14(l)]. The Assessment Plan helps ensure that the methodologies for the Injury Determination, Quantification, and Damage Determination phases in the NRDA will be completed at a reasonable cost relative to the magnitude of likely damage. The evaluation of natural resource injuries and damages will be conducted during the Assessment Phase (Figure 1).

This Assessment Plan is intended to communicate the assessment approach to the public in an effective manner so that the public can productively participate in, or comment on, assessment activities. Note that this Assessment Plan describes the Trustee’s current understanding of the assessment work necessary to complete the NRDA. Inclusion of an assessment activity in this Assessment Plan does not guarantee it will be undertaken, and implementation of initial studies may result in the addition of studies to the current list or may deprioritize others.

¹ As defined in 43 CFR § 11.14, “oil means oil as defined in section 311(a)(1) of the Clean Water Act, as amended, of any kind or in any form, including, but not limited to, petroleum, fuel oil, sludge, oil refuse, and oil mixed with wastes other than dredged spoil.” Under CECRA, a “hazardous or deleterious substance” includes all hazardous substances under CERCLA and “any petroleum product.” § 75-10-701, MCA.

Figure 1. The Natural Resource Damage Assessment Process



1.3 Decision to Perform a “Type B” Assessment

Trustees may select between a “Type A” and a “Type B” assessment [43 CFR § 11.33]. The Trustee has determined that “Type B” NRDA procedures will be followed for this NRDA given the long term, spatially and temporally complex nature of the releases and exposures to hazardous substances in the assessment area (43 CFR § 11.33). The Assessment Phase for “Type B” procedures consist of three steps: injury determination, injury quantification, and damage determination (43 CFR § 11.60(b); Figure 1). The injury determination step is where it is determined if an injury to the groundwater resource has occurred due to the release of oil or other hazardous or deleterious substances at the Site. In the injury quantification step, the extent to which services provided by the natural resource have been reduced due to the release relative to baseline conditions is established and the quantity of injured groundwater is estimated. Finally, in the damage determination step, restoration actions or alternatives, which would compensate for the injuries to the natural resource, are identified. As part of this step, a “reasonable number of possible alternatives for the restoration, rehabilitation, replacement, and/or acquisition of the equivalent of the injured natural resources,” are identified and evaluated (43 CFR § 11.82 (a)). The Trustee will make the selection of the preferred restoration alternative following public comment.

1.4 Public Participation

Public participation and review are an integral part of the assessment planning process and are included in the NRDA regulations (43 CFR § 11.32(c)). To facilitate public involvement in the NRDA planning process, the Trustee encourages the public to review and comment on this Draft Assessment Plan. The public review period is at least 30 days from the date of public release of this Draft Assessment Plan. Following the review period, the Trustee will consider

and address any public comments received, as applicable. A summary of the public comments received, and Trustee responses will be provided in the Final Assessment Plan.

This Draft Assessment Plan is available for review online at: <https://dojmt.gov/lands/nrdp-public-notices/>

Comments may be submitted in writing, before the end of the public review period, via email to nrdp@mt.gov Please put "BNLV Assessment Work Plan" in the subject line.

Or via mail:

Montana Natural Resource Damage Program
1720 9th Ave.
P.O. Box 201425
Helena, MT 59620-1425

As the Trustee moves forward with the NRDA, there will be additional opportunities for public participation.

2. BACKGROUND INFORMATION ON ASSESSMENT AREA

2.1 Site History

The BN Livingston Shop Complex facility includes an active railyard, which began as an industrial railroad and maintenance shop complex that the Northern Pacific Railroad (NPRR) constructed in 1883 (DEQ 2001). The location of the railyard is shown in Figure 2. Original facilities included a locomotive shop, car shop, wheel shop, and boiler house. During the 1880s, the passenger depot, located at Park and Second Streets, was constructed and by circa 1900 the overall facility had expanded to include car shops, a 54-foot turntable, and a 15-stall roundhouse. An industrial wastewater treatment plant (WWTP) was constructed in 1968. Today, two railroad mainlines extend through the facility. Train traffic through Livingston may range from 18 to 24 trains daily. Ten active rail sidings are maintained, along with additional tracks to adjacent facilities such as the turntable and maintenance shops (DEQ 2001).

The BN Livingston Shop Complex was owned and operated by NPRR until 1970 when NPRR merged with the Great Northern Railroad, the Chicago, Burlington and Quincy Railroad and the Spokane, Portland, and Seattle Railroad to form the Burlington Northern Railroad (BNRR). BNRR is now known as BNSF Railway Company (BNSF).

In 1987, the Montana Rail Link (MRL) purchased the buildings within the BN Livingston Shop Complex from BNRR and began operation at the facility. A group of shareholders owned and operated the Livingston Rebuild Center (LRC) until its sale in 2000 to Talgo-LRC, LLC and the USA Northwest, Inc. The Talgo-LRC company rebuilds locomotives and railroad cars and MRL performs locomotive repairs and maintenance at the facility. MRL continues to operate at the facility (DEQ 2001). As of January 1, 2024, BNSF has reacquired MRL's lease and will operate the facility.

NATURAL RESOURCE DAMAGE ASSESSMENT PLAN
 BN LIVINGSTON SHOP COMPLEX



Path: H:\GIS - CloudProject\BNSF\Montana\Livingston\Events\20210503_Livingston\Assets\Report\Fig01_LocationMap.mxd ©Kennedy/Jenks Consultants 2016
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Kennedy/Jenks Consultants

Burlington Northern Livingston Shop Complex
 Livingston, Montana

Facility Location Map

2106118*01
 June 2021

Figure 2

2.1 Description of Hazardous or Deleterious Substances Released

Operations at the BN Livingston Shop Complex have been occurring since the early 1880s (Camp, Dresser and McKee 1993). Historical operations such as fueling, locomotive cleaning and maintenance, waste oil reclamation, WWTP operations, and sludge disposal have been identified as likely sources of groundwater contamination at the Site (DEQ 2001).

In 1985, the Montana Department of Environmental Quality (DEQ) required BNSF to investigate the potential that diesel fuel was leaking into soil and migrating to groundwater (Camp, Dresser and McKee 1993). Diesel fuel was subsequently found in several monitoring wells. Additional investigation discovered volatile organic compounds (VOCs) in onsite monitoring wells and local municipal wells. In September 1988, the Montana Solid and Hazardous Waste Bureau (a predecessor unit of the DEQ) identified the presence of diesel fuel and chlorinated VOCs in groundwater on and off the railyard at the Site.

Groundwater contaminants associated with the Site include diesel fuel (total petroleum hydrocarbons) and chlorinated VOCs. Other hazardous or deleterious substances associated with the BN Livingston Shop Complex facility include semi-volatile organic compounds (e.g., polycyclic aromatic hydrocarbons), metals (e.g., lead), and asbestos. Specifically, DEQ issued a Record of Decision which identified the following contaminants of concern (COCs): chlorobenzene, 2-chlorotoluene, 1,4 dichlorobenzene, methylene chloride, tetrachloroethene (PCE), trichloroethene (TCE), vinyl chloride, benzo(a)pyrene, benzo(b)fluoranthene, benzo(k)fluoranthene, chrysene, dibenz(a,h)anthracene, indeno(1,2,3-cd)pyrene, lead, cis-1,2 dichloroethene (cis-DCE), trans-1,2 dichloroethene (trans-DCE), and asbestos. BNSF is considered a potentially responsible party (PRP) for the releases of diesel fuel and hazardous or deleterious substances at the Site. As such, BNSF has conducted extensive site characterization and remediation activities since 1985 (Kennedy/Jenks Consultants 2012).

2.2 Confirmation of Exposure

A natural resource has been “exposed” to a hazardous substance if all or part of a natural resource is, or has been, in physical contact with a hazardous or deleterious substance or with media containing a hazardous substance [43 CFR § 11.14(q)]. Before performing “Type B” assessments, the Trustee must confirm whether at least one of the natural resources identified as potentially injured in the PAS has in fact been exposed to the released substance [43 CFR § 11.37(a)]. Whenever possible, exposure should be confirmed using existing data from previous studies of the assessment area [43 CFR § 11.37(b)(1)].

The PAS identified groundwater as a potentially injured natural resource by the releases of oil and other hazardous or deleterious substances from the BN Livingston Shop Complex facility. Field investigations and remedial activities conducted over the years indicate that releases from the Site entered the groundwater, confirming exposure of this natural resource.

3. ASSESSMENT APPROACH

As noted above, the purpose of the Assessment Plan is to ensure that the NRDA is completed in an organized and systematic manner, and that the methodologies utilized for the assessment can be conducted at a reasonable cost [43 CFR § 11.30(b)]. As specified in the DOI regulations, the NRDA should:

1. Determine whether injuries to natural resources have occurred [43 CFR § 11.62];
2. Identify the environmental pathways through which injured resources have been exposed to hazardous substances released from the Site [43 CFR § 11.63];
3. Quantify the degree and extent (spatial and temporal) of injury in terms of a reduction of the quantity and quality of services² from baseline conditions [43 CFR § 11.70]; and
4. Establish appropriate compensation for those injuries [43 CFR § 11.80].

This Assessment Plan focuses on groundwater resources at the Site. Groundwater resources include water beneath the surface of land or water and the rocks or sediment through which it moves and include any groundwater that meet the definition of drinking water supplies [43 CFR § 11.14(t)], which are any raw or finished water sources that may be used by the public or by one or more individuals [43 CFR § 11.14(o)].

Existing data available from the Site and its vicinity will be used to implement the NRDA and determine and quantify injuries according to this Assessment Plan. Baseline conditions may be established based on the review of historical, pre-release data and information, or by reference areas that exhibit similar physical, chemical, and biological conditions as the assessment area and lack exposure to the releases (43 CFR § 11.72). Preliminary restoration alternatives will be developed, in collaboration with NRDP, to address groundwater injuries and resulting lost services.

Where critical data gaps are identified during the assessment process, these will be discussed with NRDP to determine the best path forward. "Critical data gaps" are any data gap likely to substantially change the type or scale of restoration needed to compensate for the injuries (e.g., gaps in the conceptual site and mass discharge models, gaps in understanding of the horizontal or vertical extent of groundwater contamination). For the purposes of the NRDA, addressing data gaps could include developing agreed-upon reasonable assumptions or additional primary data collection. Prior to completing the assessment and after discussing with NRDP, BNSF will submit a data gaps evaluation, including recommendations for addressing the identified data gaps, to NRDP for review and approval. NRDP will review and comment on the data gaps evaluation and recommendations prior to BNSF completing the assessment and submitting the full assessment report. Further, any additional data collection required would be conducted pursuant to an NRDP-approved work plan. A draft work plan would be submitted to NRDP for review and comment prior to any data collection activities. Once all identified data

² For groundwater resources, this "may include computation of the volume of water affected, volume of affected ground water pumped from wells, volume of affected ground water discharged to streams or lakes, or other appropriate measures" (43 CFR § 11.71(i)(4)(i)).

gaps are addressed, BNSF would continue with the assessment and development of the assessment report.

3.1 Data Sources

The DOI NRDA regulations state that the NRDA be conducted in a planned, systematic manner and at a reasonable cost (43 CFR § 11.13(c)). Therefore, the NRDA will rely primarily on data and information already available. Where existing data are insufficient, additional data and studies may be needed to determine and quantify injuries (e.g., to fill critical data gaps, as described above).

Many reports and datasets are available for the Site, including the Remedial Investigation, Annual Maintenance and Monitoring Reports, Remedy Task Reports, various Technical Memoranda, and other readily available data and information. General data sources that will be evaluated in the NRDA include:

- Baseline risk assessment (Camp, Dresser and McKee 1993);
- Remedial Investigation /Feasibility Study (RI/FS) data and reports (e.g., Envirocon 1994; 1994; 1998);
- Task A and H comprehensive interim action and confirmation sampling summary report (Kennedy/Jenks Consultants 2008);
- Summary of the investigation/remediation history for the Site (Kennedy/Jenks Consultants 2012);
- Task G remedial action reports for petroleum hydrocarbons in groundwater (e.g., Kennedy/Jenks Consultants 2015a, 2016);
- Task L bedrock aquifer supplemental investigation reports (e.g., Kennedy/Jenks Consultants 2015b, 2015c);
- Private and public well inventories (e.g., Kennedy/Jenks Consultants 2017, 2018);
- Task F air sparge/soil vapor extraction evaluation report (Kennedy/Jenks Consultants 2021a);
- Annual monitoring and maintenance reports (e.g., Kennedy/Jenks Consultants 2010; 2014; 2021b);
- Task L bedrock aquifer pilot test report (Kennedy/Jenks Consultants 2022);
- Miscellaneous technical memoranda and long-term groundwater monitoring data collected for the Site and compiled into Excel-format database and reported in the annual monitoring and maintenance reports.

The data sources will be analyzed to verify that supporting documentation is available and sufficient to allow for an evaluation of the reliability and usability of the information in determining injury for both the alluvial and bedrock aquifers. NRDP intends to review existing information for potential reference sites, injuries to groundwater with respect to applicable criteria, nature and extent of groundwater contamination, potential restoration opportunities,

and potential scaling techniques. NRDP will provide the results of this analysis to be incorporated into the NRDA. If additional data are determined to be necessary, a work plan will be developed in consultation with the NRDP for the collection of those data (see process described under Section 3 above).

3.2 Injury Determination

According to the DOI NRDA regulations, injury determination has two parts, determining whether sufficient exposure pathways exist (or have existed) by which hazardous substances and/or petroleum products are (or were) transported in the environment, resulting in natural resource exposure to those substances and determining that an injury has occurred that meets the definitions of injury [43 CFR § 11.63].

An injury to the groundwater resource has resulted from the release of a hazardous substance if concentrations of that substance exceed drinking water standards (Safe Drinking Water Act [SDWA] or Clean Water Act [CWA]), water quality criteria, or in sufficient quantity to have caused injury as defined in paragraphs (b), (d), (e), or (f) of 43 CFR § 11.62. BNSF will compare the water quality data from the Site, compiled in the project database for the alluvial and bedrock aquifers (e.g., water quality data to support Task and Annual Reports) to relevant water quality benchmarks (e.g., the Circular DEQ-7 Montana Numeric Water Quality Standards, Maximum Contaminant Levels (MCLs)) for COCs in groundwater for both the alluvial and bedrock aquifers. Water quality standards developed to be protective of aquatic life in surface water bodies will be used to ensure that natural resource services where groundwater discharges to surface water will be accounted for in the service loss estimates.³ BNSF will only use data that have been approved for use by DEQ during the data validation process associated with the relevant Tasks for the Site, including Tasks F, G, K and L.

Per 43 C.F.R 11.63(a)(2), “the pathway may be determined by ... demonstrating the presence of the oil or hazardous substance in sufficient concentrations in the pathway resource.” Accordingly, for the purposes of this NRDA, it will be assumed that COCs found in groundwater (i.e., in the plumes delineated for the Site) originated from Site activities and are, therefore, relevant for determining and quantifying injury.

BNSF will evaluate the factors contained in 43 CFR § 11.63(c), including the elevation of top and bottom of the alluvial and bedrock aquifers and confining units and the transmissivity and hydraulic conductivity of aquifers and confining units. The rate of transport of the oil or hazardous substance in groundwater also will be estimated.

3.3 Injury Quantification

As part of the injury quantification phase, the NRDA will determine the extent of any injuries to groundwater due to releases from the Site and quantify the loss of services due to those injuries relative to the baseline condition [43 CFR § 11.70]. This includes a determination of

³ The use of aquatic life water quality criteria is protective of potential impacts of services in discharge zones because it does not assume any dilution of groundwater in the transitional zones where groundwater discharges to surface water.

baseline conditions and associated baseline services. To quantify the loss of services over time, the NRDA will also determine the recoverability of the injured resource, which is the time needed for the injured resource to recover to the state that the Trustee determines services are restored, rehabilitated, replaced, and/or the equivalent have been acquired to baseline levels [43 CFR § 11.73].

3.3.1 Determination and Characterization of Baseline Conditions and Services

Baseline conditions are conditions “that would have existed at the assessment area had the discharge of oil or the release of hazardous substance under investigation not occurred” (43 CFR § 11.14(e)). The NRDA, therefore, will determine “the physical, chemical, and biological baseline conditions and the associated baseline services for injured resources at the assessment area” and will quantify injury based on the reduction of services from that baseline level (43 CFR § 11.72(a)). Baseline conditions are not pristine but are conditions that would be present without the releases of hazardous or deleterious substances from the Site. They refer to both concentrations of COCs in the natural resource as well as the level of natural resource services that would have been provided had those releases not occurred. The DOI NRDA regulations suggest using historical data to evaluate baseline conditions if they are available [43 CFR § 11.72(c)]. BNSF will evaluate whether there may be historical sampling data consistent with 43 CFR 11.72(c) that reflects “baseline,” such as City of Livingston well sampling data prior to any Site contamination in the groundwater and/or whether data from reference area(s) may be used to establish baseline groundwater conditions (43 CFR § 11.72(d)). The extent to which Site-related remediation actions have replaced potentially lost natural resource services will also be evaluated; i.e., BNSF will include in its evaluation when the City of Livingston drinking water wells were moved and any other impacts to beneficial groundwater uses.

3.3.2 Quantification of Spatial and Temporal Extent of Injuries

Quantification of lost groundwater services requires characterizing the spatial extent of any injury to groundwater (e.g., acreage of any groundwater plumes, volume of groundwater impacted or areas that do not allow access to use groundwater because of exposure concerns) as well as the timeframe over which those losses are expected to occur. Contaminant data and historical records can help determine the spatial and temporal extent of injuries to groundwater due to releases from the Site to determine whether groundwater services or injuries were likely impacted in 1981, when damages start accruing under CERCLA and when those services are expected to return to baseline conditions (e.g., following site remediation and/or natural recovery). Site data will also be used to quantify the potential magnitude of service loss relative to baseline conditions as well as to map the spatial extent of those groundwater service losses. Tools such as geographic information systems may be used to facilitate spatial quantification.

BNSF will rely on the groundwater data compiled in the project database, groundwater plumes that have been delineated for the Site, and estimates of aquifer depths to estimate the horizontal and vertical extent of oil or hazardous substances in both the alluvial and bedrock aquifers consistent with 43 CFR § 11.71(i). Where existing data are insufficient to delineate groundwater plumes, (1) additional data collection may be required and/or (2) reasonable

assumptions may be utilized, such as a statistical based analysis to estimate the horizontal and vertical extent of the groundwater plumes. Additional detail regarding each input for injury quantification purposes is provided below:

- The spatial extent of groundwater service losses will be estimated based on previous and ongoing work at the Site. This NRDA will rely on DEQ-approved alluvial groundwater plume delineations (e.g., Kennedy/Jenks Consultants 2010, 2014, 2018) and ongoing work delineating the bedrock groundwater plume (e.g., Kennedy/Jenks 2015a). The estimate of spatial extent of service losses will also account for areas targeted for institutional control associated with Site-related groundwater contamination. This includes areas encompassed by the City of Livingston's ordinance prohibiting installation of groundwater wells due to groundwater contamination as well as any Controlled Groundwater Areas that will be placed pursuant to the Record of Decision for the Site.
- The potential magnitude of groundwater injury will be estimated by comparing groundwater concentrations from representative wells over time to relevant water quality benchmarks (see Section 3.2).
- The volume of groundwater, in acre-feet, associated with the potential loss of groundwater services will be estimated based on the area delineated within the plume and estimates of aquifer depth from the Site (e.g., Kennedy/Jenks Consultants 2015a). This volume estimate could be developed as a flux volume and/or a stock volume, as determined through discussion with NRDP.
- The effects on the groundwater resource during the recovery period resulting from potential remobilization of discharged or released substances that may be adhering, coating, or otherwise bonding to geologic materials are assumed to be accounted for in the groundwater data that have been collected from the Site since the initiation of active groundwater remediation.
- The timeframe of the injury: from 1981, when damages start accruing under CERCLA to when those services are expected to return to baseline conditions (e.g., following site remediation, resource replacement and/or natural recovery).

3.3.3 Resource Recoverability Analysis

The time needed for the alluvial and bedrock aquifers' injured resources to recover to baseline will be estimated. BNSF will rely on time-trend analyses using monitoring well data collected over time to estimate the time needed for recovery if no restoration, rehabilitation, replacement, and/or acquisition of equivalent resources efforts are undertaken beyond response actions that have already been performed or are anticipated to be performed at the Site. In addition to the time-trend analysis, BNSF and NRDP may consider information on recovery times for injured groundwater from the literature.

3.4 Damage Determination

Once groundwater injuries and the loss of natural resource services is quantified, the appropriate scale of restoration required to fully compensate the public for those lost services

and the cost to perform the restoration projects are determined in the damage determination step. These analyses will be documented in a Restoration and Compensation Determination Plan (RCDP) which will include the following [43 CFR § 11.81 (a)(1)]:

- A list of a reasonable number of alternatives for restoration, rehabilitation, replacement, or acquisition of equivalent resources and the related services lost to the public associated with each. Alternatives will be developed with sufficient detail to evaluate for the purpose of selecting the preferred alternative;
- Selection of the preferred alternatives;
- The rationale for selecting those alternatives; and
- A detailed description of the method(s) to determine the cost of the selected alternative and the compensable value of services lost to the public through the recovery period associated with the selected alternative.

3.4.1 Interim Losses

Resource equivalency methods (e.g., resource equivalency analysis, or REA) will be used to determine the appropriate amount of natural resource damages, and restoration required, to compensate for groundwater losses (Lane et al. 2010). The basic premise of REA is that the public can be compensated for past and expected future losses in natural resources and the services they provide through the provision of additional natural resources and equivalent services in the future (43 CFR § 11.83(c)(2)). These “compensatory” services provided through restoration or replacement are in addition to remedial actions taken to restore the resource to its baseline condition, since simply restoring the resource after an extended period will not make the public whole for losses that have occurred in the interim. Damages calculated using REA are expressed in terms of the cost to complete natural resource replacement projects of an appropriate type, size, and location. REA explicitly accounts for the rate of time preference economists have shown people hold for goods and services; people prefer to consume goods and services in the present rather than delaying their use or consumption to a future date. To reflect this, losses that stretch over time can be expressed as a simple present value loss using standard discounting calculations.

The two stages of conducting a REA for injured groundwater are to (1) quantify the present value volume of injured groundwater (i.e., the “debit”), and then (2) quantify the cost of compensatory restoration actions that restore or protect an equivalent present value volume of groundwater (i.e., the benefits or “credit”).

The following inputs will be considered in the REA:

- Duration of injury: Start of injury is 1981 based on the first full year after the passage of CERCLA, and the duration of injury will be determined as described above.
- Spatial extent of injury: Groundwater plumes previously delineated for the Site (e.g., Kennedy/Jenks Consultants 2010, 2014, and 2018), groundwater plumes delineated or statistically inferred in the bedrock aquifer, plus any relevant institutional control areas; measured in acre-feet of groundwater.

- Groundwater services: an understanding of the services provided under baseline and how those services have been impacted by contamination (e.g., Dunford and Locke 2015; Griebler and Avramov 2015).
- Discount rate: 3%

3.4.2 Compensatory Damages

Primary cleanup costs, including active remediation of aquifers, is part of the remedial action for the Site and will not be quantified as part of this Natural Resource Damage Assessment, which will focus on compensatory restoration for natural resource damages. Damages will be estimated based on the cost to implement restoration projects that will fully compensate for the service loss estimated with the REA as described above, including maintenance and monitoring activities as well as NRDP's administrative costs to oversee the restoration projects.

BNSF and NRDP will collaboratively identify restoration alternatives that are relevant to the groundwater injuries and service losses for this Site. Once restoration alternatives have been identified, NRDP will evaluate the candidate restoration projects and rank them using criteria developed consistent with the DOI NRDA regulations [43 CFR § 11.82 (d)]. These criteria will include, but may not be limited to, the following:

- The technical feasibility of the restoration action;
- The cost-benefit and cost-effectiveness of the restoration or acquisition of equivalent resources;
- Results of actual or planned response actions;
- Potential for additional injury or adverse effects on human health and safety to be caused by the restoration action;
- The natural recovery period and the ability of the natural resources to recover without restoration;
- Potential effect of restoration actions on human health and safety; and
- Consistency and compliance with Federal, state, and tribal policies and laws.
- Policy Criteria: NRDP also has generally evaluated restoration actions according to the following policy criteria:
 - Normal Governmental Function: This criterion evaluates whether a restoration action involves activities for which a governmental agency would normally be responsible or that would receive funding in the normal course of events and would be implemented if recovered natural resource damages were not available.
 - Price: NRDP evaluates whether any property interests to be acquired are being purchased at or below market value.

The cost-estimating methodologies will include some combination of comparison methodology, unit methodology, or other methodologies listed in 43 CFR § 11.83(b). NRDP will assist BNSF in

developing costs. All information used to develop costs will be provided in the RCDP (see Section 3.5 below).

BNSF will develop the information on alternatives and the Trustee will evaluate the alternatives and select the recommended alternative, following public comment.

3.5 Restoration and Compensation Determination Plan (RCDP)

After completing the NRDA, a RCDP will be prepared that includes all the information in 43 CFR § 11.90, including the PAS, the Assessment Plan, and findings from the Assessment Phase (i.e., injury determination, injury quantification, and damage determination steps). The draft RCDP will include a preliminary estimate of damages and scoping of conceptual restoration projects. The underlying REA calculations will be provided to NRDP in accompanying spreadsheets. Following NRDP’s approval of the draft RCDP, the Draft RCDP will be provided to NRDP. The Final RCDP will be developed based on comments from NRDP as well as comments received during the public review process and responses to those comments. The timeline for submitting the Final RCDP will be established by NRDP following submittal of the Draft RCDP.

The timelines provided above are dependent on the use of existing data for the assessment; additional time will be added if primary data collection ends up being determined necessary.

4. SUMMARY OF ASSESSMENT ACTIVITIES AND SCHEDULE

The assessment activities and estimated timeline required to determine and quantify groundwater injuries associated with this Site, determine damages, and complete the RCDP, as described in Sections 3.2 through 3.5, are summarized in Table 1 below.

Table 1. Assessment Activities for the BN Livingston Shop Complex

Activity No.	Assessment Activity	Brief Description	Estimated Timeline
1	Identify and compile available data	Existing data sources will be identified and compiled (including, but not limited to, the data sources described in Section 3.1). This will include an evaluation of the quality of available data sources.	30 days after finalization of this Assessment Plan
2	Evaluate existing data and data gaps	Existing data sources compiled under Assessment Activity #1 will be reviewed and the sufficiency of the available data for injury quantification will be evaluated. This will include development of a data gaps evaluation report NRDP’s review and discussion.	Within 30 days of completing Assessment Activity #1

3	Address data gaps	Determine agreed-upon approach, with NRDP, to addressing data gaps identified in Assessment Activity #2. The remainder of this estimated timeline assumes data gaps are addressed using existing data and/or reasonable assumptions. If primary data collection is deemed necessary, NRDP may first perform a preliminary estimate of damages consistent with 40 CFR § 11.32 to ensure assessment costs are reasonable; otherwise, this will be accomplished in Activity 6. This timeline would be updated to incorporate the time required for data collection efforts.	Within 45 days of completing Assessment Activity #2
4	Determine injuries	Determine natural resources injuries as described in Section 3.2.	Within 90 days of completing Assessment Activity #3
5	Quantify injuries	Establish baseline conditions and characterize the temporal and spatial extent of natural resources injuries to quantify injuries as described in Section 3.3.	Completed simultaneously to Assessment Activity #4
6	Determine damages	Identify and evaluate conceptual restoration alternatives and scale restoration alternatives to determine damages as described in Section 3.4.	Within 90 days of completing Assessment Activity #4 and #5
7	Assessment Report	Develop an assessment report, summarizing the findings of the Assessment Phase, for discussion with and review by NRDP.	Within 60 days of completion of Assessment Activity #6
8	Feasibility analysis of identified restoration alternatives	Evaluate the range of restoration alternatives identified (during Assessment Activity #6 and any other restoration project idea solicitation efforts) according to the criteria listed in Section 3.4.2.	Within 120 days of completion of Assessment Activity #7

9	RCDP	Complete a RCDP as described in Section 3.5. The preliminary draft RCDP will be discussed with and reviewed by NRDP. The final draft RCDP will be released for public review and comment. After the public comment period, public comments will be considered and addressed as appropriate, before finalizing the RCPD. This timeline would be updated to incorporate the time required for NRDP review and public comment.	Preliminary draft for review by NRDP within 60 days of completion of Assessment Activity #8
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