**Enclosure 1**

**US Forest Service General Comments**

**Moffat Collection System Project, Draft Environmental Impact Statement**

**US Army Corps of Engineers**

**March 2010**

Enclosed are the general comments of the US Forest Service (USFS) for the proposed Moffat Collection System Project (Project). The US Army Corps of Engineers (ACOE), on behalf of Denver Water (DW), presented their analysis in a Draft Environmental Impact Statement (DEIS), published in October 2009.

## General Comments, Draft Environmental Impact Statement (DEIS)

The US Army Corps of Engineers (Corps) website proved frustrating in that it was often not possible to access the DEIS documents.

The Full Use Existing System (Full Use) is stated to include "new projects, changes in existing projects and operations, increases in demand levels, and administrative changes that are anticipated to occur between now and the year 2016." Although the DEIS only provides summary data, it is clear that the Full Use flows would have significant adverse effects to the aquatic resources of the North Fork of the South Platte River and mainstem of the South Platte River. The Forest Service is requesting clarification from the Corps about how agency concerns related to the Full Use scenario will be addressed in this process.

The DEIS typically provides only general statements regarding project effects to stream flow. Lacking more specific information, it is not possible for the US Forest Service (USFS) to determine site-specific deleterious effects. For example, under the proposed alternative, is it reasonable to expect overbank flows on the North Fork of the South Platte River, and if so, when might these occur and how frequently? Would they occur in potential and occupied Preble's jumping mouse habitat located along the North Fork? Should we anticipate rapid daily flow changes, and if so, what is the expected duration and timing of these flows? Will there be bank sloughing resulting from rapid daily flow changes, and what will the consequences be for aquatic, terrestrial and cultural resources? Will planned flow fluctuations result in fish stranding or scouring of trout fry in affected habitats?

The DEIS states: "Although Denver Water's operations affect flows along the South Platte River from Antero Reservoir downstream to the Henderson gage, average annual and monthly flow changes would be less than 10% in almost all months of the 45-year study period. Therefore, the South Platte River was not included as a focus river segment." Because the South Platte was not included as a focus segment, the DEIS neither addressed nor described potential impacts, particularly in reference to tailwater fisheries in these stream sections.

**Aquatic Invasive Species**

We found no information regarding the presence of aquatic nuisance species which are present in the DW system. For example, the document should have disclosed the risk and described potential measures to avert the transportation of zebra mussels from Dillon Reservoir to the North Fork of the South Platte River and downstream reservoirs.

**Aquatics**

Forest Service General Issues with the Aquatic Biological Resource Report-PHABSIM analysis:

1. It is uncertain if IFIM meant PHABSIM in the analysis. IFIM is Instream Flow Incremental Methodology, a description of a *process*, whereas PHABSIM is a Physical Habitat Simulation Model, a quantitative model that provides comparable results for habitat area produced for different fish life stages over a continuous range of flows. Please clarify.
2. The analysis does not address any of the USFS study requests. The studies requested were necessary to provide information to help analyze project effects and eventually develop mitigation. These requests were dismissed by both DW and the FERC with the expectation that the DEIS would provide the requested information. After reviewing the DEIS, it is obvious that USFS interests were not addressed and that the data gaps described in the original study requests still exist.
3. The USFS has technical concerns with the PHABSIM modeling. For example; uncertainty exists about the habitats represented by modeling, too large a time step was used in the analysis to allow for adequate estimation of effects, and the results on a large stream system mask the effects on the smaller systems, the focus of our study requests.
4. The DEIS did not model the effects of alternatives on habitat for native cutthroat trout. This important species should have been included in the analysis.
5. The use of mean annual flow in the analysis masks the effects of the alternatives because the time step is too large
6. The Corps has direction from the US Fish and Wildlife Service (FWS) to assess the effects of actions on Lineage Greenback (GB) fish outside their historic range. Although several streams in the project area contain Lineage GB fish, the DEIS neither analyzed nor disclosed effects of the Denver Water operation on those populations. In addition to the exclusion of greenback cutthroat trout, the DEIS also failed to analyze several USFS aquatic special-status species that will be affected by increased diversions from the Fraser River basin.
7. The USFS is unable to assess the effects of proposed changes in flow or the frequency of dewatering on affected stream reaches because the DEIS provides insufficient data on the individual tributary streams. The DEIS masks the effects of the proposed action on flow changes and potential increases in the frequency of dewatering on individual tributary streams by focusing primarily effects to mainstem reaches.
8. The DEIS contains no discussion on how changes in diversion operations and increased volumes of water would affect individual fish. The DW system does entrain fish, yet the DEIS states in multiple locations: “Flow changes would have negligible or minor effects on habitat for special status aquatic species. Changes would occur downstream of Colorado River cutthroat trout occupied habitat.” The Forest Service questions the accuracy of this conclusion because some of the diversion structures are located within occupied habitat,

resulting in direct effects due to entrainment and the diversion of water on special status aquatic species.

## Hydrology

### A. Selection of Sampling Sites

The sampling sites selected do not represent the range of channel types in the Fraser River and Williams Fork River basins. It appears that the sampling sites were only selected if the channel was in good condition and stable within a given channel type (i.e., unstable channels were not sampled). In addition, the sampling sites selected are skewed toward Rosgen A and B channel types, which are less likely to be sensitive to morphological changes from existing and proposed flow alterations. For example, 48 percent of the St. Louis Creek drainage consists of a Rosgen C channel type (response reach) and yet the sampling site selected was in a Rosgen B channel type (transport reach). Because more sensitive reaches (i.e., pool-riffle channels or Rosgen C type channels) and steep tributary reaches are underrepresented in the list of sampling sites, the analysis and conclusions drawn are incomplete.

Selecting only one sampling site on a limited number diversion sites does not reflect the range of channel responses that may occur along a channel. The accuracy of extrapolating channel responses from the results of a single sampling site to other locations along the channel or other channels is questionable. At a minimum, multiple sampling sites should have been selected for each channel type along the focus river segment to better understand the range of existing conditions and potential responses to the proposed action. Sampling site locations should have been determined randomly within a given channel type to minimize operator bias when selecting sampling sites.

The DEIS does not include a sampling site on Vasquez Creek downstream of Gumlick Tunnel where flows are projected to increase by 20% through the tunnel with the addition of water diverted from the Williams Fork drainage. This proposed increase in flows could potentially affect channel stability, channel morphology, and aquatic habitat along Vasquez Creek between the Gumlick Tunnel outflow and the Denver Water Board diversion structure. This creek should be sampled and the information made available in the FEIS.

### B. Hydraulic Capacity and Operation of Diversion Structures

The dimensions, hydraulic capacity, and operational history of each diversion structure needs to be provided in order to evaluate the impacts of the existing diversion structures on fluvial processes and channel morphology from the 1) natural flow and sediment regime and 2) proposed changes to the operation of each diversion structure. The FEIS should show: the annual and maximum annual volume of water diverted by the diversion structure in a given year: the annual and annual maximum peak discharge diverted by the diversion structure; the maximum discharge capacity of the diversion structure; how the diversion structure discharge capacity compares to the flow remaining in the channel; whether the diversion structure span the channel; how the diversion structure affects the transport of sediment to the downstream channel.

**C. Transport Capacity, Sediment Supply, and Effective Discharge**

The relationship between transport capacity and sediment supply are poorly described. The premise that the morphology of channel will not change because transport capacity is considerably greater than sediment supply from the proposed flow changes is incorrect. Existing channel morphology reflects that it is in balance or in dynamic equilibrium with the current flow and sediment regime. Just because transport capacity remains greater than sediment supply when peak flows are reduced during average and wet years does not necessarily indicate morphological channel changes will be minimal due to implementation of the proposed action. Reducing the frequency of effective discharge and annual transport capacity will decouple the sediment transport conveyor belt by eliminating or reducing Phase 2 sediment transport, which is critical for creating and maintaining channel form.

The proposed action may eliminate frequent, moderate flood events in, which are generally considered to determine channel dimensions and form. This can cause pools to become shallower as they fill with sediment and cause the channel to gradually narrow as riparian vegetation becomes established along the channel margins. This effect will be more apparent and likely in low gradient, unconfined channels. As a result, larger, more infrequent, floods during higher water years may be unable to remove the established vegetation. At several of the sampling sites sand deposition was observed and considered an indicator of potential aggradation (see sampling site descriptions in section 3.1.6.1 and 3.1.6.2). The proposed reduction in peak flows during average and wet water years will exacerbate sand/fine gravel deposition and channel aggradation.

The study design used to assess the impacts of changes in sediment transport capacity on channel morphology is not well described in the DEIS. The USFS has the following concerns with the analyses and interpretations:

1. Use of the sediment supply estimates from the Two Forks EIS is not supportable (Simons and Associates, 1986). If the sediment supply equations from the Two Forks EIS are to be used in this EIS, the relevant assumptions, channel geometry, sediment transport data, and results from that study should be provided. Without this information, a reader cannot objectively evaluate how the sediment supply data and results from the Two Forks EIS apply to this study or if the sediment supply equations from the Two Forks EIS drawn were appropriately applied.
2. It is important from a channel morphology perspective to show how the mobilization of D50 and greater size particles are effected by flow alterations (Phase 2 sediment transport). Reducing the frequency of Phase 2 sediment transport could have an adverse effect on channel morphology.
3. Transport capacity needs to be assessed at discrete particle size intervals. No data were provided for the transport capacity of discrete particle size intervals at different flows (total load only presented).
4. The Meyer-Peter Müller equation is inappropriate for estimating bedload transport in steep, mountain channels composed of gravels, cobbles, and boulders. Channel beds are considerably coarser and steeper than the studies used to develop the equation. Other bedload transport equations that use field data to calibrate the bedload transport model to the site would be more appropriate.

5. Field data were not collected to "calibrate" the quantity and size of bedload being transported at different discharges.
6. Prediction of sediment mobility and transport volumes are notoriously difficult, and in most cases inaccuracies can be by orders of magnitude even when an appropriate bedload transport equation is used. Results from such studies should be used with caution when predicting potential channel responses.

**D. Assumptions Used to Model Flow Hydraulics and Transport Capacity in HEC-RAS**

The assumptions used to model flow hydraulics and transport capacity using HEC-RAS were not presented and the general limitations of using HEC-RAS to model flows and transport capacity in steep, forested, mountainous channels were not discussed. In addition, the limitations of using flow hydraulics and transport capacity output from HEC-RAS to assess channel impacts and responses to flow alteration were not discussed.

Sediment sampling data should be used to calibrate sediment transport equations. Whenever possible, the use of measured sediment loads for testing and calibration of the equations is preferred to modeling exercises. Additionally, because pebble counts tend to be biased towards larger particle sizes and underestimate the presence of smaller size fractions in the channel bed, the lack of collecting subsurface data as was done in this study will further reduce the accuracy of sediment transport capacity estimates.

**E. General Hydrology**

Inappropriate baseline: The logic behind the selected baseline for effects analysis is unclear. The selected baseline minimizes the volume of diversions the effects analysis is based on. The baseline for effects analysis should be 2006 rather than projected full use in 2016 (difference in volume of diversions in the full use compared to proposed action scenario is only 3000 AF/year). The "Full use" concept is questionable based on the Forest's understanding of the conveyance limits in the Moffat collection system. Rather than simply asserting that Denver would maximize diversions, the EIS must provide an improved description of how full use would be achieved without additional storage to verify that the full use scenario is even possible.

Demand forecast is unreasonable and the actual use of Moffat water is obscured: Demand projections are inaccurate when compared to actual use in period between 2000 and 2003. From the description of the Moffat WTP as "primarily a peaking plant", it appears as if the projected supply shortfall is mostly due to hypothesized demand for outdoor irrigation water. Furthermore, portions of the perceived supply shortfall appear to be self imposed by DW such as the recent selling of 3000 AF/year of water to Arvada (in exchange for real estate to build a reservoir on), contingent on success of this proposal.

The effects analysis of sediment transport and channel morphology impacts is incorrect: This analysis must include consideration of Phase II bedload transport rather than simply accounting for bed surface fines. Phase II transport involves the partial mobilization of the bed material and is a critical component of channel maintenance (Schmidt and Potyondy, 2004). Moreover, the bed material characterizations used a method that was incorrectly applied. Estimates of a channel's available sediment need to consider subsurface materials which a pebble count would not reveal. Results and conclusions are also based on incorrect interpretations of information

contained in published USFS research papers. The watershed sediment "supply" equations used are in fact sediment discharge equations and fail to characterize watershed sources of sediment.

Mitigation: All agreements with other entities to mitigate the effects of the project should be shared in the EIS in order for the effects to be assessed. The mitigations included in the DEIS, do not offset potential impacts and are not sufficient. For example, several of the affected channels on the west slope are proposed by the State for the 2010 303(d) listed (temperature impairment) streams.

Water losses associated with an enlarged Gross reservoir area: Evaporative losses for an enlarged Gross reservoir appear to be erroneously low. Although there is a brief mention in the groundwater effects section, the document does not quantify changes in bank storage at an enlarged Gross reservoir and increased transmission losses in the project conveyance system. This information is needed to assess the efficiency of alternatives in terms of water use.

Reduction in the number of days at or above effective discharge in affected streams is objectionable: Available research supports the importance of maintaining high flows in these steep, coarse grained stream channels. It appears that the planned flow diversions will siphon off the range of flows most critical to maintaining the form and functions of streams in these watersheds. There is a need to provide over the long term, the same average number of days of effective discharge as pre-diversion period to maintain channels. This means that during the "wet months of wet years", high flows must be provided in these channels rather than entirely diverted. The assertion that the remaining high flows can be diverted without affecting channel morphology counters published research results and is not supported by conditions in the field. See Grand County Stream management plan for recommended flow regimes as potential mitigation. This may become even more important in the future. In an atmosphere of changing climate and projected decreases in snowpack, the likelihood of wet years where the high flows are by-passed is further diminished.

Changes in flood risk: Need information, preferably mapping on expanded flood zones below an enlarged Gross (in event of dam failure).

Effects on Floodplains: The analysis of effects to floodplain/riparian vegetation on the west slope is insufficient. Explain how floodplains will get smaller due to either vegetation invasion due to dewatering or lack of flooding. For example, the floodplains are expected to be "smaller in area" when in fact they may disappear altogether since they would no longer be inundated in relatively frequent events (1.5 year RI) or greater than bankfull channels. Reducing the energy available for lateral migration will reduce the formation of new lateral accretion formed floodplains in C channels.

Alternative effects on Hydrology: Supplemental environmental analysis should be conducted to compare the Project alternatives for temperature, sediment, nutrient and chemical impairment. This work should include modeling that evaluates changes in concentration throughout the system, accounting for water quantity decreases and increases from both diversions and tributaries.

Effects to Arapaho National Recreation Area reservoir water quality: The DEIS needs to include a discussion in the cumulative effects section regarding effects to water quality as weed/algae control and clarity (Grand Lake) are existing issues.
Table 1-2 fails to mention other common means for extending the use of supplies such as wastewater recycling for domestic use.

Arapaho Roosevelt, Pike and San Isabel, and White River Forest Plan direction: The Land and Resource Management Plans (aka Forest Plans) for the affected Forests are only mentioned in relation to Visual Resource Objectives. The DEIS is silent on any other Forest Plan requirements. The Moffat system and effects from the use of the Moffat system occur on public lands. Therefore, the DEIS must incorporate standards, geographic and management area direction and show how forest plan direction would or would not be met under the proposal.

Cumulative Effects: The cumulative effects analysis is inadequate because it ignores the effects of Denver's existing diversions. Even though the cumulative effects chapter begins by defining cumulative effects as the "the impact on the environment which results from the incremental impact of the action when added to other past, present, and reasonably foreseeable future actions…" effects of the existing diversion system are not disclosed or analyzed. This is a major flaw because the existing diversion system is the major existing impact, and its effects are ongoing and widespread. Estimates of unregulated flow of diverted and augmented streams should be included in the analysis.

Selection of field sites: The streams sites do not appear to be representative of streams diverted by Denver. For the Fraser basin, all sites selected either have bypass flows or are downstream of a confluence with streams that have bypass flows. This is not representative of the effects of Denver's diversion system. The Fraser diversion system diverts from 31 streams. Only 10 of the streams have bypass flow provisions. Each of the streams is fairly large, in the context of streams in the Fraser basin. The majority of diverted stream are much smaller. None of the sites are located immediately below diversions, where the effects of diversion are most pronounced. Further, no stream surveys compared conditions above and below diversions. Such a comparison would help to support or refute the conclusions that the project would have minimal cumulative effects.

Average vs. firm yield: While the purpose and need is defined in terms of firm yield, the rest of the document discusses change in flow and diversion in terms of average yield. The concept of firm yield is probably not widely understood by the audience reviewing the EIS, and a discussion of the firm yield versus average yield would be helpful.

**Recreation**

1. The Moffat Collection System Corps DEIS does not reference the Gross Reservoir Hydroelectric Project EA dated 2000. This document analyzed affects on Recreation and Visual Resources for the relicensing project at that time.
2. The Moffat Collection System DEIS does not specify recreation/visual resource actions as the 2000 EA did, nor does it adequately analyze affects to the extent necessary to properly comment.

**Wildlife / Weeds**

1. Outdated references: The DEIS sections reviewed appear to be outdated – for example, references to Colorado Division of Wildlife (CDOW) databases and verbal communication are dated 2005; references to Colorado Natural Heritage Program data are from 2005; and the USFWS Species List in Appendix G is from 2005. CDOW and CNHP data were updated in 2009; and the USFWS list was most recently updated in May 2009. Most of this information is available on the internet. CNHP data does not currently include any data for Proposed, Threatened, Endangered, Forest Service Sensitive, or rare/local concern plants on the Forest since 2000, including new or revised element occurrences for plants, so is nine years out of date. There are hundreds of plant records not posted to the CNHP database. The Forest Service is currently entering these data into a new release of the USFS NRIS TESP database, and once this is finished the data will be migrated all at once to the CNHP database. In the meantime, the ARP Forest botanist can provide data specific to this project.
2. Special Status Plants: Based on the best available data, in conflict with Forest Service policy, this project is likely to adversely affect population viability on the Planning Unit (ARP) for one FS Sensitive species and two rare/local concern species. The project may also affect viability on the ARP for two additional rare/local concern plant species. All five species were found in the vicinity of Gross Reservoir during surveys for the 2001 Denver Water FERC licensing. Of the five, only the FS Sensitive species is mentioned in the DEIS and that is only mentioned in a species list table. It is not mentioned in the body of the DEIS as occurring in the area, and effects are not analyzed. The remaining four species are not mentioned in the DEIS or appendices. Mitigations and salvage efforts are recommended under Sections 4.6.7.1 and 4.8.7; however it must be recognized that even with mitigation measures, values and species may not be comparable. Some rare plants that would be inundated probably cannot be found elsewhere and purchased or protected.
3. Fens: There is no discussion of surveys done to determine presence or absence of fens, or communication with any experts who might provide further information about known or likely fen occurrences in the project area. Furthermore, there is no analysis of impacts to fens, which are a conservation priority for the USFS and for the USFWS Mountain-Prairie Region, and are considered a Category 1 wetland by the USFWS. This is particularly important in the Williams Fork area, where fens are present (documented in the DEIS Chapter 3) at both river segment sample sites selected by the CORPS to represent effects to other project river segments. Fens are a unique, irreplaceable resource and are sensitive to changes in hydrology such as those proposed with this project.
4. Species lists: All species lists in the DEIS Chapter 3 and Appendix G are outdated and/or incomplete. This includes Forest Service Sensitive species, Management Indicator species, and rare/local concern plants.
5. Special Status Species analysis: The Special Status Species sections in Chapter 3 and 4 are inadequate and missing important information. Chapter 3 contains one short paragraph and Chapter 4 contains less than one page that attempt to describe the affected environment and effects to special status species other than three federally and/or state-listed animal species that are discussed individually.
6. Plant species analysis: There is no environmental baseline or analysis for any plant species except those federally listed plants potentially affected by water depletions,. The sections on vegetation discuss rare plant communities, but do not mention any individual plant species,

even though “Impact of reservoir inundation on rare plants or communities” is listed as a primary issue under the vegetation section in Chapter 4.

7. Wildlife habitats and ARP Forest Plan: There is no discussion of important wildlife habitats relevant to the ARP Forest Plan, including old growth, effective habitat, interior forests, and corridors. There is no discussion about consistency with the Forest Plan regarding these habitats or other Forest Plan goals, objectives, standards, and guidelines that apply to wildlife, botany, and noxious weeds.